TIDENS GUN

A PICTORIAL HISTORY OF THE LEWIS GUN

OWLTREASURY
BIOLOGY TEXTBOOKS

PALADIN'S PICTORIAL HISTORY OF THE LEWIS GUN

by

J. David Truby

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Preface

Despite the global popularity the Lewis machine gun gained through six decades of combat, the developer of the weapon remains a very private figure about whom little is known. History has ignored Colonel Isaac N. Lewis, and, so it would seem, has much of his family and many of his friends. As of this writing, only one of his children —a daughter—is alive, and she cares nothing for the story of the Lewis gun. Of the two sons who worked with their father, Wheatly Lewis was most closely involved with the business. Unhappily, scores of Lewis documents, pictures and records have disappeared into South America with Wheatly's son, Richard Wheatly Lewis, Jr.

With the sole exception of Paul Lewis, a favorite nephew of "Uncle Newt," (a favored family name for Isaac Lewis), the other Lewis heirs have adamantly refused to help the author in any way. However, the generous help and kind friendship of Paul and Bess Lewis was more than enough to portray Isaac Lewis as a man. They knew him well, and had been many times to his home in Montclair, N.J.

The personal philosophy of Isaac Lewis helped to create a lack of documentation, as well. On November 28, 1918, he wrote in a letter to a friend at West Point: *I have never believed much in paper records and so have no history to write ...* Lewis was also quite camera-shy. The late Major-General Julian Hatcher, who knew Lewis, once remarked: "Colonel Lewis would rather the camera point at this machine gun of his and the men firing it. It is what is for sale, not its inventor."

Another explanation of the lack of photos of Colonel Lewis was given by Paul Clifford of Wide World Photos, who noted: "During the 1916 to 1918 period in which Lewis was making headlines, the film that was available was in Europe covering the fighting."

Another problem in reporting the full story of this man and his inventions is that many of the early official records of ordnance development are, simply, no longer with us. Many of the armories and early testing facilities had their records and photographs destroyed at the whim of a new commander. Also, when certain of the facilities were moved or closed, documents were frequently ordered burned. Hundreds of historical documents and photographs have, literally, gone up in smoke. Of these, few original Lewis materials remain.

Many of the secondary sources, i.e., books about other books, are not very accurate. They tend to replicate errors made by the writer they quote, who replicated the error of the eariler writer, and etcetera. Original reports, documents, letters or archive microfilms are thus, the safest source of documentary fact. Fortunately, I was able to contact an assortment of wonderfully cooperative people who provided me with access to these remaining primary sources; the pieces of my historical jigsaw puzzle about Isaac Lewis.

These folks should get all due credit for helping me locate the pieces. Any errors in putting those pieces together properly falls to me. The person who deserves the most thanks for helping me is Don Thomas: my sounding board, reference librarian, technical consultant, patron for my first Lewis gun shoot, enforcer of technical accuracy, and, best of all, my friend.

The following folks provided me with access to original documents, special collections, technical information, photographs and other archive materials. For this help I wish to thank them:

John B. Calfee; G.A. Costner; Doug Duer; J. Curtis Earl; William Easterly; Craddock R. Goins, Jr.; Ian V. Hogg; Mrs. Thomas F. Kinahan; Robert S. Krauss; Paul and Bess Lewis; Merle C. Olmsted; James Stoneley; Jim Sullivan; Clarence Tegtmeyer; Rear Admiral Kemp Tolley; Robert F. Van Allen.

In addition, the following gentlemen provided me with original graphics, production data, military records, museum records, and other vital data:

Arthur Blindell; F.C. Brown; L.O. Brown; Colonel Frank B. Conway; Roger Cox; Colonel Allen Crist; Force Dancer, B.S.A.; Earle G. Harrington, Savage Arms Company; Stacy Hinkle; Edward Hine, Imperial War Museum; Brigadier General John H. Hunter; E.A. Scherer; Charles Yust.

I appreciate the unselfish help of Gayle Neely and Phyllis Roumm in translating documents and letters from around the world.

There are also special people without whom this book would not have been completed. Not wishing to "gush" as authors do, let me simply say thank you to this group of friends:

Max Atchisson; Mrs. Billie Farris; Dolf Goldsmith; Major Frank W.A. Hobart; the late Colonel G.B. Jarrett; Paul Lewis; John Minnery; Konrad F. Schreier, Jr.; Peter Senich; CWO-4 Thomas Swearengen.

In closing, I am always delighted to hear from anyone who has a Lewis anecdote or photograph to share.

J. David Truby
Indiana, Pennsylvania 15701
May, 1976

1. Isaac Lewis' Military Mower

The model 1917 Lewis gun produced for ground use.

USMC

The name Isaac Newton Lewis is not one to spark a gleam of respectful recognition in the eyes of the casual student of ordnance. Such a student devotes his admiration to Browning, Gatling, Gardner, Hotchkiss or Maxim. Yet, the ingenuity of Isaac N. Lewis, based on the earlier work of Dr. Samuel N. McClean, brought forth a weapon which many ordnance experts believe to be the equal of the above-listed types, if not their superiors. We call this weapon—a gas-actuated, air-cooled light machine gun—the "Lewis gun," in honor of its foremost developer and salesman.

The domestic history of the Lewis gun begins in 1911, when Lewis exhibits a hand-made model of his gun to a number of Washinton ordnance officers. Lewis later manufactures four more guns, bringing them to Washinton in 1912 for exhibition before the Secretary of War. In one notable exhibition, the Lewis gun is fired from an airplane in flight at the Signal Corps Aviation School, College Park, Maryland; the first time a machine gun has ever been fired from an aircraft.

In spite of the tremendous publicity these exhibitions generate, Lewis receives no orders. In January, 1913, he sails for Europe, taking with him the four guns manufactured for the United States demonstrations. A Belgian company is formed, named Armes Automatique Lewis, and the four weapons, firing U.S. service ammunition, are exhibited in various countries of Europe.

By 1914, the Lewis gun gains the approval of both the Belgian and British governments, and production begins at Liege. The manufacturing facility proves too small to satisfy Belgian and British demands, so an agreement is reached whereby the guns are produced in England, by the Birmingham Small Arms Company (B.S.A.)

Mrs. Thomas Kinahan

Col. Isaac Lewis

Below: John M. Browning examines his BAR as Mr. Burton from Winchester looks on.

National Archives

Vicker-Armstrong Engineering

Right: Sir Hiram Maxim, right, showing British and Chinese officials how his machine gun would cut a tree in half.

Sec. of War Elihu Root

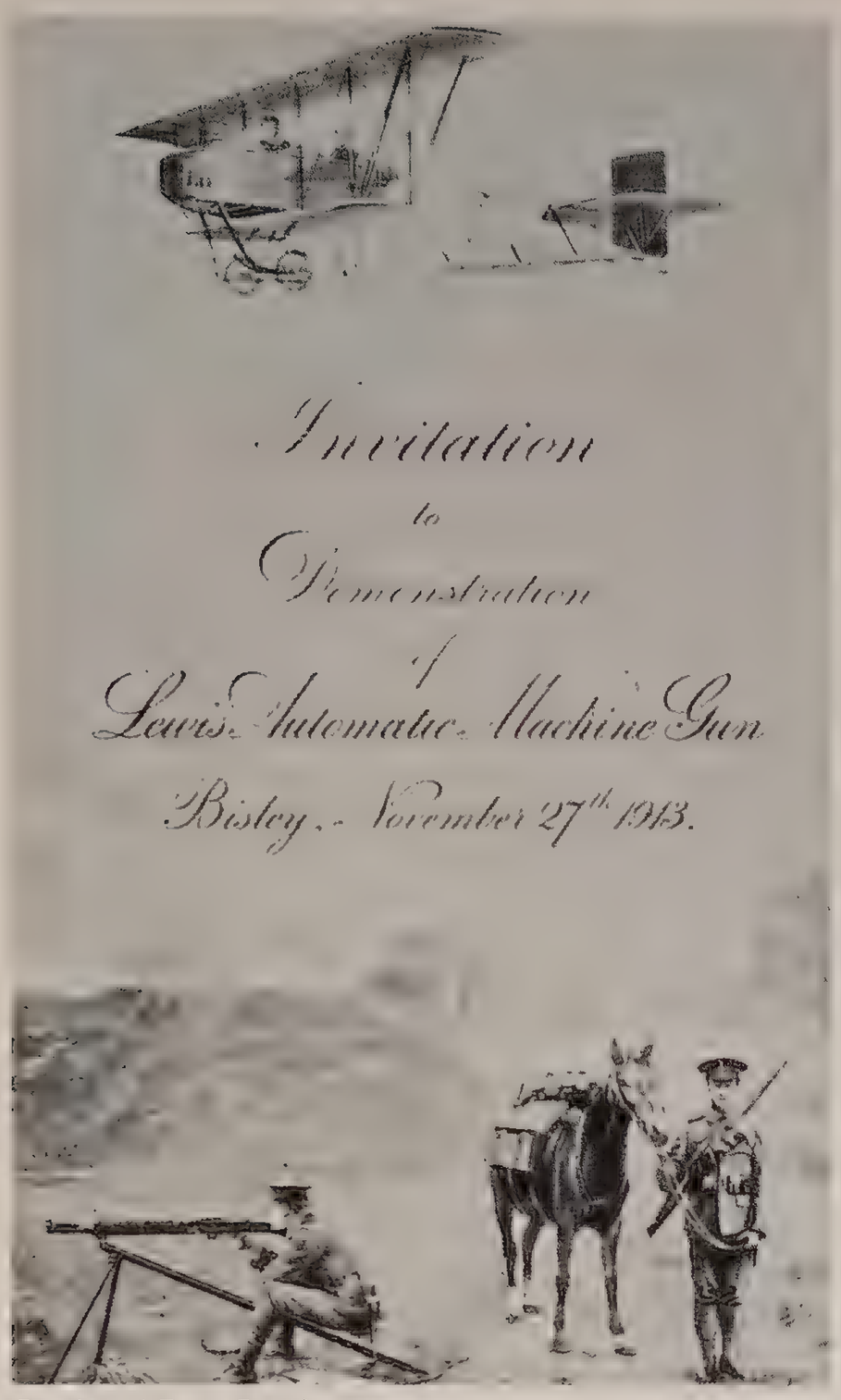
National Archives

Following page: Capt. Charles DeF. Chandler holds the initial Lewis gun fired from an aircraft as Lt. Roy T. Kirkland poses as the pilot. Lt. Kirkland was not the pilot for the initial flight.

Experts watch an early test of the Lewis gun by Marine gunners, including George F. Lewis (second from left,) and Col. John Dooley (extreme right).

USMC

US Army



Paul and Bess Lewis

This cover artwork for a formal invitation to one of his earliest European demonstrations shows the personal touch of Isaac Lewis.

Ecole Royal Militaire

Sales promotion sheet advertising the Lewis gun in Europe.

USMC

B. S. A., Ltd.

Utica Public Library

Above: The Savage Arms Company plant during WWI.

Top, preceding page: The initial Maxim Machine Gun, for sale to the world.

Bottom, preceding page: The Birmingham Small Arms plant which produced thousands of Lewis guns during WWI.

Sanderson Picture Corp.

Right: The 8mm Chauchat machine gun worked fairly well. When ordnance officers converted the weapon to the American cartridge, a fiasco was born, and that fiasco was issued to the Yanks—costing many lives.

Bottom: German troops used captured .303 Lewis guns, regarding them as valuable weapons. This picture was taken during the Battle of the Somme in 1916.

Imperial War Museum

When the war in Europe begins, almost the entire capacity of the B. S.A. plant is turned to the manufacture of Lewis machine guns. The British government, with both Lewis and Vickers factories open to them, orders six times as many Lewis guns as Vickers. The British demand for the Lewis gun is so great that manufacture is also begun by the American firm, Savage Arms Company, of Utica, New York. In addition, a factory is opened in France, at St. Etienne.

By early 1916—a scant five years after Lewis exhibited the hand-made model—more than forty thousand Lewis guns are in use by the British, French, and Belgian forces. During the Battle of the Somme, British ordnance experts estimate the rate of Lewis gun fire in excess of 15 million rounds every twenty-four hours. By the close of 1916, the British have fired more than 7 billion rounds of ammunition through their Lewis guns.

During the war, Isaac Lewis spends most of his time in England, supervising the production of his gun. By this time, the B.S.A. plant is turning out more Lewis guns each week than all of the machine guns supplied to the U.S. Army since the invention of the weapon. When American troops finally reach France, Lewis is disgusted to see these troops armed with French Chauchat machine guns, instead of his weapons. By this time, over one hundred thousand Lewis guns are in combat against the Germans.

Right: An original McClean gun, before Col. Lissak went to work to lighten the weapon.

Following page: Capt. Chandler fires the Lewis gun prior to taking it aloft, the date was 7 May 1912.

Savage Arms Company

USAF

"The Lewis was all we had ..."

A small unit of Marines learns how to use the Lewis gun mounted on a tripod at

Quantico, Va. The tripod helped increase the maximum accurate range of the Lewis.

USMC

Testing a Lewis gun with a most unique aiming and firing device. Nothing is known of this experimental operation tried during WWI.

National Archives

Marine instruction in the Lewis gun involved the use of improvised slings to fire the weapon in the assault position.

USMC

USMC

Above: Col. John Dooley of Savage Arms Company fires his personal Lewis gun, a stripped down model, at the Company range near Utica.

Imperial War Museum

Right: Another variation of the wagon wheel-mounted Lewis AA gun.

The British had adopted the Lewis as their standard light machine gun by 1915, thus beginning a "love affair" that was to last for several decades. The Lewis was immortalized in the 1918 British publication entitled *The Complete Lewis Gunner*, which offered the following homilies:

A Lewis gun in the hands of good gunners will work as much destruction as fifty average riflemen. The rat-tat-tat of a Lewis gun has a great moral effect. Against a machine gun a man stands little chance, and human flesh will not face it. A machine gun has terrible killing powers. A Lewis gun gives a maximum volume of fire from a minimum of front."

The British reprinted this publication in 1944, years after the Lewis was in semi-retirement, although still serving in limited skirmished.

The First World War was the war of the Lewis light machine gun, and served to inspire a great deal of thought on the subject of the gun's tactical deployment. A Canadian ordnance officer, Captain Lewis Keene, noted that offensive mobility was a proper attribute of the Lewis gun. In 1917, he wrote of the Lewis:

Lewis guns are distinct weapons from machine guns and are used by the infantry, and in the front line work they go over with the second and later waves. They are inconspicuous, can be carried easily, and look at a distance like rifles. The rate of fire is better and more concentrated than that of a machine gun.

Another ordnance expert had this to say:

Was ever a more useful weapon so mishandled, and on some occasions even forgotten? When one considers the use made by the enemy of his light machine guns as an attacking weapon, then we can realize what sheer waste we indulged in.

Also raised was the question of what, exactly, the Lewis gun should be called: an automatic rifle, or a light machine gun? According to its developer, it could do the work of both. This, of course, did not please the military minds; favoring, as they did, a somewhat more discriminating view.

In England, one of the founding pioneers of the British Machine Gun School, Brigadier General C.D. Baker-Carr, was most emphatic in his judgement of the Lewis as an automatic rifle. In 1928, he told Machine Gun School instructors:

During the war, the Lewis was all we had, so we put a machine gun mounting on it and called it a machine gun so our troops would't lose confidence.

But a Canadian officer, Captain Herbert McBride, made the following observation:

The Lewis gun is rated in the United States Army as a light machine gun, and I can offer no objection to that designation. We, in the Canadian Army, consider them automatic rifles. They are wonderfully effective weapons, whatever you call them, and we are mighty glad to get them for use with advancing troops.

Why did Britan and other nations purchase great quantities of this successful weapon while the United States did not? The answer to this question provoked one of the greatest controversies the U.S. Board of Ordnance has ever weathered.

Most historians attribute the failure to adopt the Lewis gun by the United States to a mammoth, deep-seated personality conflict between Isaac Lewis and William Crozier, Director of the Board of Ordnance.

"An asset of priceless value ..."

Crozier delighted in refering to the Lewis gun as "...Lewis' military mower." There were also certain mechanical problems with the early weapons tested by the United States; the gas pressure on the bolt action was so strong on its return to the rear, the extractor tore through the rims of the cartridge casings.

Another Lewis concern was simplicity. The final model, therefore, had but sixty-two parts, and was designed for ease in assembly and care. Early sales brochures for the Lewis gun stressed that each part had only one position, so the gun could not be assembled incorrectly.

The Lewis gun weighed twenty-six pounds, compared to the thirty pounds of the Benet-Mercie, the ninety-three pounds of the 1914 Colt machine gun with tripod, or the 153 pounds of the Model 1904 Maxim with tripod and full water jacket. The Lewis fired up to 750 rounds per minute from its pan-shaped magazine, or drum, which was designed in two sizes: forty-seven rounds or ninety-seven rounds. The cartridges were arranged like the spokes of a wheel in the Lewis ammo drums. The gun fired from an open-bolt position. Its normal firing rate was low enough that controlled bursts were possible through trigger manipulation.

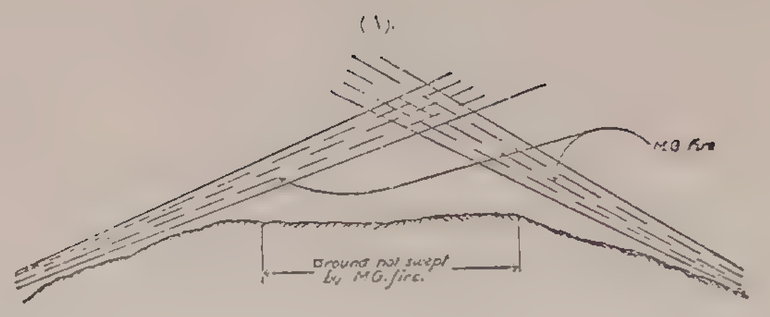
Despite the above features, however, the Lewis was regarded as simply another automatic gun, a class of weapon generally ignored. The United States, therefore, was behind the rest of the world powers in machine gun development at the beginning of World War I. Only the Savage Arms Company and Marlin-Rockwell were actually producing machine guns at the outbreak of hostilities; all for foreign governments. The Savage plant was turning out Lewis guns in .303 for the British and Canadians, while Marlin-Rockwell was manufacturing Colt machine guns for the Russians. When the United States finally entered the war in April, 1917, there were still no plants turning out machine guns for the troops. Colt, at this time, was merely equipping itself with machinery to begin work on an order of more than four thousand Vickers weapons for the War Department.

One week after President Wilson, through Act of Congress, declared war, Savage Arms received their first major U.S.-originated order for the Lewis gun: 1300 Lewis guns for the Army. At the time, the U.S. armed forces had less than one thousand rapid-fire guns of any type, including more than several dozen Gatlings. European allies were turning out fantastic amounts of Lewis guns at this point, which they claimed as the most effective light machine gun of the war.

According to the company records of the Savage Arms Company, the initial government order actually occurred in 1916. The order was for 353 of the .303 caliber Lewis guns Savage was building on order for the British. These weapons were hurriedly sent to the Mexican border when General John Pershing chased after Pancho Villa. After this, the .303 Lewis was redesigned to handle the .30 caliber U.S. service cartridge.

The 1916 and April, 1917 orders were followed in May of 1917 with an order for two thousand five hundred guns. Other orders received by Savage included nine thousand two hundred and seventy Lewis guns for Navy and Marine use, plus 47 thousand for use by the Air service. In addition, Savage continued to build Lewis guns in .303 for the Canadian armed forces.

Sketch from British manual showing how mobile Lewis gun can cover fire areas not swept by heavy weapons.



David Truby

A Lewis gun in action at the Battle of the Somme, near Ovillers in July of 1916.

Imperial War Museum

British soldiers and "friend," a .303 Lewis gun.

Imperial War Museum

Early model Lewis gun produced by BSA for use on their heavy tripod.

B.S.A., Ltd.

British .303 Lewis gun MkI stripped.

Maj. Frank W. A. Hobart

Early tests of the Lewis gun proved the weapon would fire from any position, even ide down.

USMC

US troops, armed with British .303 Lewis guns cross into Mexico with Gen. Pershing.

National Archives

Imperial War Museum

Led by their Lewis gunners, men of the 1st Wiltshire Rgt. show captured German helmets after fighting at Thiepval in September of 1916.

f there was a serious criticism of Lewis, it had to do with what British officer termed,"...an able reputation for the ingenuity number of its stoppages in action retrospect, however, and according to a concensus of ordnance experts, the stoppage record of the Lewis was probably as good or bad as a similar weapon of the period. The difference was that Lewis stoppages were easier to rectify. In addition many experts agree that the majority of early stoppages were due to faulty ammunition, not the weapon.

One of America's better known and finer ordnance experts the late Colonel George Burlington Barrett, noted that the Lewis performed very well when properly adjusted He added that proper adjustment was sometimes a problem for the untrained shooter.

A typical "adjustment" complaint against the Lewis was that the rate of fire suggested by its developer was too low, and that cyclic rate should always be adjusted to the maximum. Some early instructors felt this way, and showed their students how to up the firing rate of the Lewis. This point was easy to sell because the great majority of unskilled gunners "know" the machine gun fires its best when it fires its fastest. This, in fact, is quite the reverse of the truth.

Despite mechanical problems, the Lewis proved to be a popular and effective weapon among those whose opinion really counted: the men who used it in combat. Writing in *Scientific American*, C.H. Claudy credited the Lewis with creating more casualties than any other single weapon on the battlefield. He quoted a British officer as claiming the Lewis to be the firepower equal of twelve infantrymen.

According to one observer, "... the Lewis gun was an asset of priceless value in the hands of scouts and skirmishers." He went on to describe how its "hammer blow" effect had proved paralyzing to the Germans. The observer correctly defined the role of the Lewis as a Mobile automatic weapon, and wrote glowingly of its ability to create havoc in an attack situation.

As quickly as it proved its popularity, the Lewis gun also proved its versatility, serving as a light machine gun for ground troops, then quickly being adapted for aircraft use, anti-aircraft use, and convoy protection in air, sea or upon the land.

2. The Machine Gun Man

NEW YORK TIMES

"My service career is rather shallow, with nothing coming of it ..."

US Military Academy Archives

Preceding page: Isaac N. Lewis at the age of 70.

Maj. Isaac Lewis in 1907.

In 1908, when he writes the above statement to a friend, Isaac Newton Lewis—a fifty year old army major—has already served as the focal point of a controversial congressional hearing investigating "obsolete policies and worn-out conditions" in the Board of Ordnance.

As recorder of the Board of Ordnance and Fortifications, Lewis rocks official Washington with his absolute candor and honesty, and his outspoken criticism of his superior; the autocratic Brigadier General William Crozier. The resulting public out-cry prompts Elihu Root, secretary of war and a staunch Lewis supporter, to bring the so-called Lewis plan to the attention of Congress, which obliges by making Lewis' recommendations for change into law.

In return for his efforts, Lewis is banished to a remote post in San Francisco, California; there, ostensibly, to serve out his career a victim of the practice known as "limbo posting."

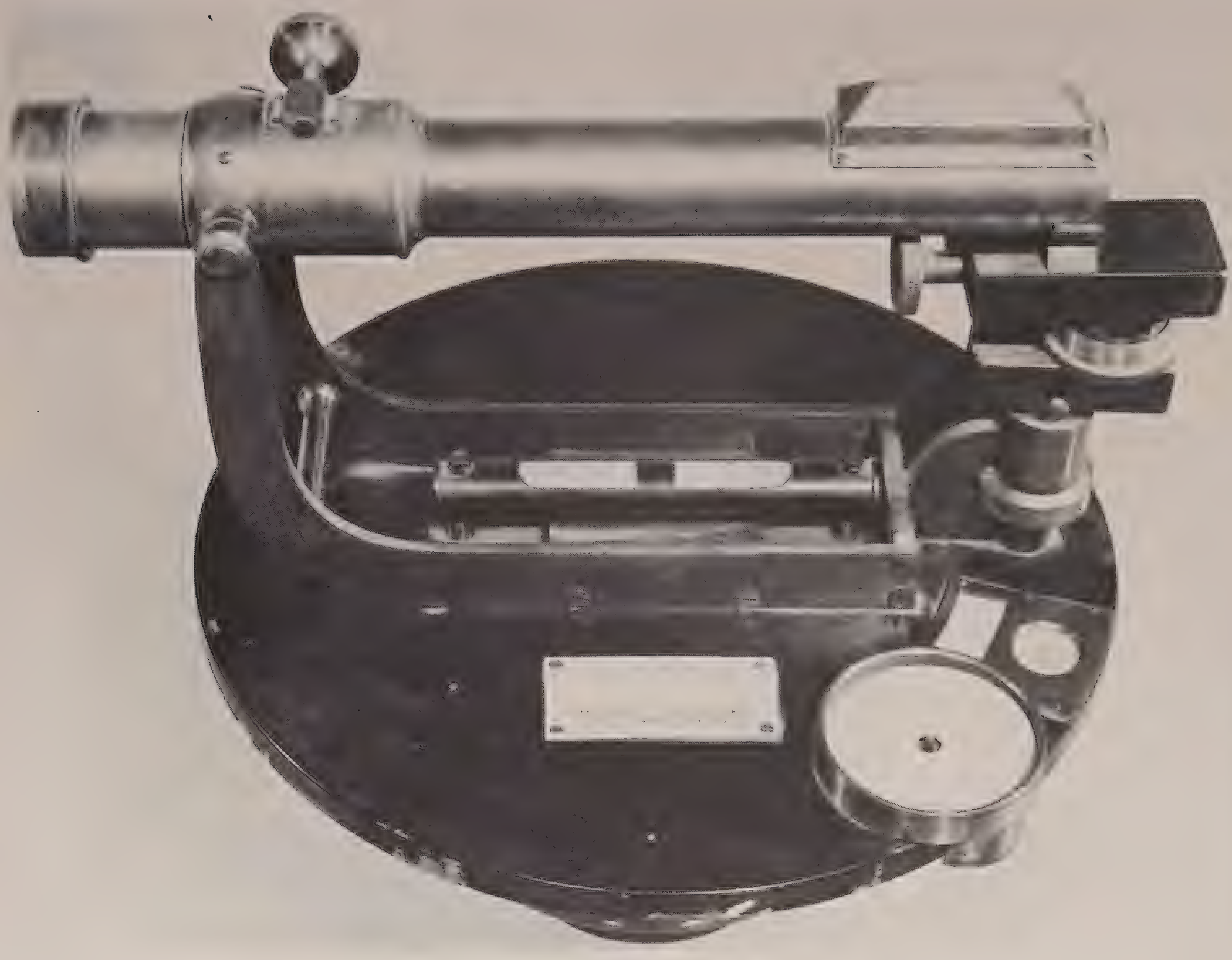
Born 12 October 1858 near New Salem, in Fayette County, Pennsylvania to James and Anne Kendall Lewis, the boy named for a great physicist will be no stranger to public controversies. He will end his career as the protagonist in one of the Board of Ordnance's most bitter episodes; as the brilliant, analytical inventor of more than a score of military devices; as the patriot who grandly donates over one million dollars to his nation's Treasury Department, and will live in history as the principal developer of a near-legendary light machine gun: the Lewis gun.

Moving, with his family, to Harvey County, Kansas in the spring of 1879, the twenty-one year-old Isaac embarks on a career as the teacher of a public school in Walton, Kansas. He quickly tires of this sedentary life, and in the spring of 1880, participates in a competitive examination for a cadet vacancy at the West Point Military Academy. Of forty candidates, Lewis wins the appointment.

"The drilling and discipline were about as disagreeable as can be," writes Lewis of his cadet days, "but I can be intolerable of these sorts of things."

It is during a Christmas respite from the drilling and discipline that Isaac meets his bride-to-be, Mary Wheatley, at the home of a classmate. The chance meeting grows into romance between Lewis and this reverend's daughter.

During the year 1884, Lewis graduates from West Point; eleventh in his class of thirty-seven. He is



US Military Academy Archives

The M1898 Lewis Position Finder.

commissioned a second lieutenant, and assigned to the Second Artillery. Two years later he graduates from Torpedo School, and on 21 October 1886 he marries Mary Wheatley. They will have four children: daughters Laura and Margaret, and sons Richard Wheatley and George Fenn.

For several years, following the narrow routine of peacetime army life, Lt. Lewis spends his spare time perfecting his engineering designs.

Returning to his adopted state of Kansas, with orders to station at Ft. Leavenworth, Lewis patents the world's first successful artillery range and position finder, in 1888. It is a professional triumph for the thirty year-old career officer, yet strangely, it sets the pattern for so many Lewis designs to come: his own government refuses the range finder, even as a gift. Somewhat discouraged, Lewis sells the patent rights to Driggs-Seabury, a private firm. In 1898, and again true to the pattern of Lewis' inventions, the U.S. military is forced to buy the range finder commercially, for use in the war on Spain.

During June 1891, Lewis is promoted to the rank of first lieutenant. The following June he is assigned to Ft. Wadsworth, New York, and engaged by the Board of Ordnance and Fortification while serving with the First Field Artillery. By 1894 he is a member of the Board on the Regulation of Coast Artillery Fire in New York Harbor, and by 1898, recorder of the Board of Ordnance and Fortification. In 1899, Lewis transfers to the Seventh Artillery. As the century ends, Lewis is promoted to Captain and transfers again; this time to the Sixth Artillery.

In July of 1900, at the behest of his patron, Colonel Nelson A. Miles, Lewis is placed on special duty under the personal instructions of Elihu Root. His assignment is to tour Europe, studying methods of manufacture and supply of ordnance. Following this tour, his reports are responsible for the adoption of new standards of organization for artillery, in 1902.

His assignment completed, Lewis returns to his post as recorder of the Board of Ordnance; the position which will launch him into the Washington controversies, and eventually lead him to his "limbo post" in San Francisco.

Fortunately, Lewis is not a man to be bound by adversity. He siezes the opportunity of his new assignment to design a new and successful system of harbor defense for San Francisco; a plan which is immed-

Smithsonian Institution

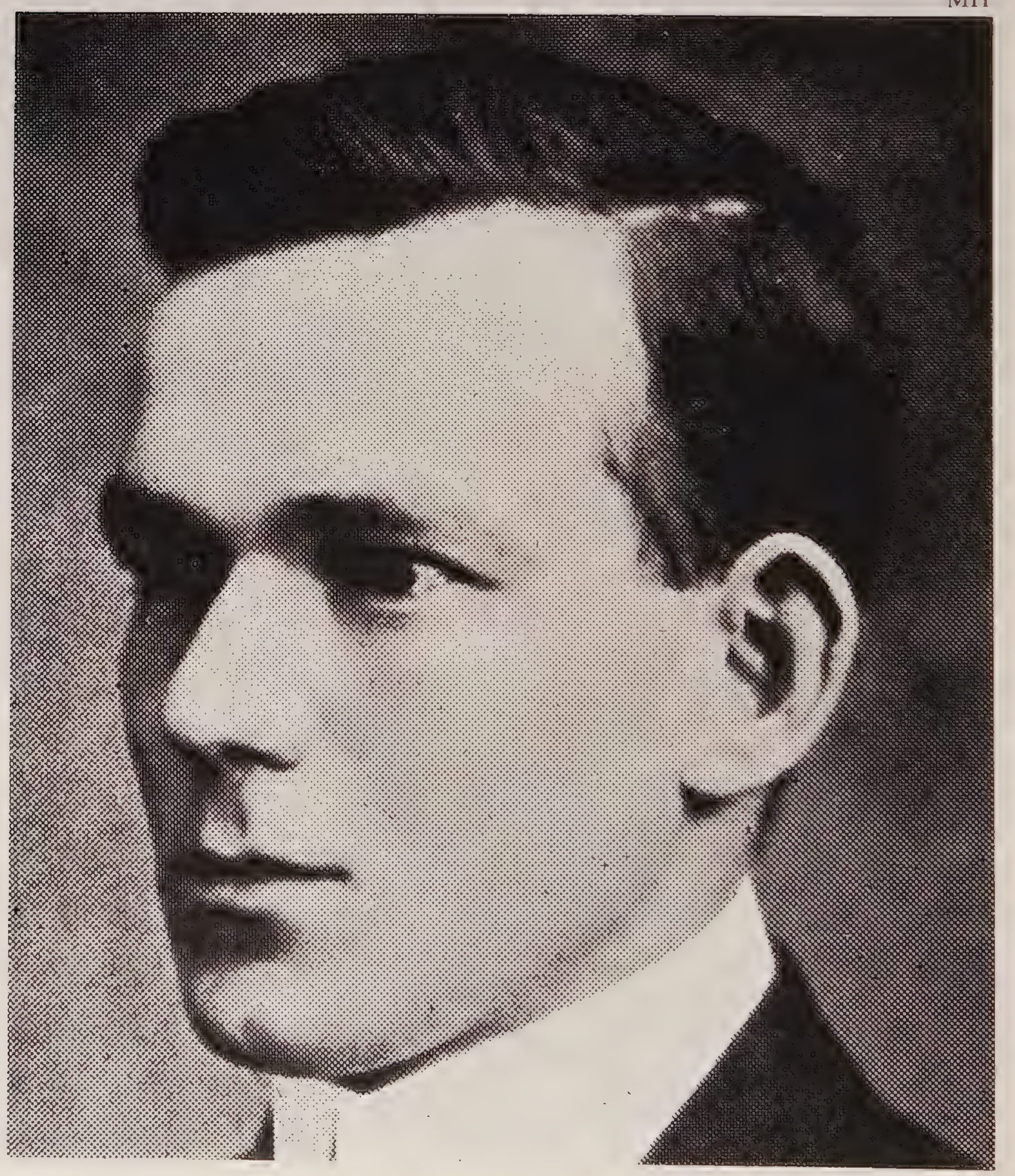
iately accepted and readied for use. When the news of Lewis' success reaches Brigadier General Crozier, orders are immediately issued: Lewis is sent to further military exile, at Puget Sound.

"Why is it that some of the biggest men in military and government positions have the smallest minds?" muses Lewis, writing of the incident.

In Isaac Lewis' official War Department statement of service, the Crozier-ordered exiles are written of as "duty at posts in Western Department." Despite this, Lewis continues to invent, design, and build his reputation within the professional community. By the summer of 1904, the ridiculous situation of William Crozier hiding one of the Army's shining scientific lights in the "Western Department" becomes intolerable, and in September 1904 Captain Lewis is returned to Washington.

Lewis immediately joins the Coast Artillery School at Ft. Monroe, Virginia, serving as an instructor in electricity and power. He rises to artillery instructor; director of the department of enlisted specialists; acting commandant of the school, and, ultimately, to commander of Ft. Monroe and the Artillery District of the Chesapeake. During these changes in duty responsibility Isaac Lewis receives two promotions: becoming a major in 1907, and, in 1911, a lieutenant colonel.

MIT



Preceding page: Brig. Gen. William Crozier

Right: Richard Wheatley Lewis's MIT graduation picture.

TO BE RETAINED BY THE DEPOSITOR.

No. - 6802
DUPLICATE G

Treasury Department,

OFFICE OF THE TREASURER OF THE UNITED STATES.

$10,889.17

Washington, D. C. June 15 1917

I certify *that* Isaac N Lewis Colonel USA Rtd
(By letter dated June 12 1917--Chf of Pub Moneys Dvsn)
has this day DEPOSITED TO THE CREDIT OF THE UNITED STATES
Ten thousend eight hundred eighty-nine 17/100 *Dollars,*
on account of Donation to the Government

for which I have signed duplicate receipts.

Deputy *Assistant Treasurer United States.*

TREASURER'S OFFICE—Form 5252.
CASHIER.—Ed. 10,000 sets—F. C., May 10-16. 15 A 41pa 3—1214

J. David Truby

A duplicate copy of the receipt which acknowledged that Isaac Lewis had returned money to this government, just as he had claimed.

US Military Academy Archives

Cadet George Fenn Lewis, USMA

Following page: Patent sketch of Isaac Lewis 's weapon design.

I. N. LEWIS.

AUTOMATIC FIREARM.

APPLICATION FILED APR. 10, 1912.

1,142,896.

Patented June 15, 1915.

2 SHEETS—SHEET 1.

FIG. 2.

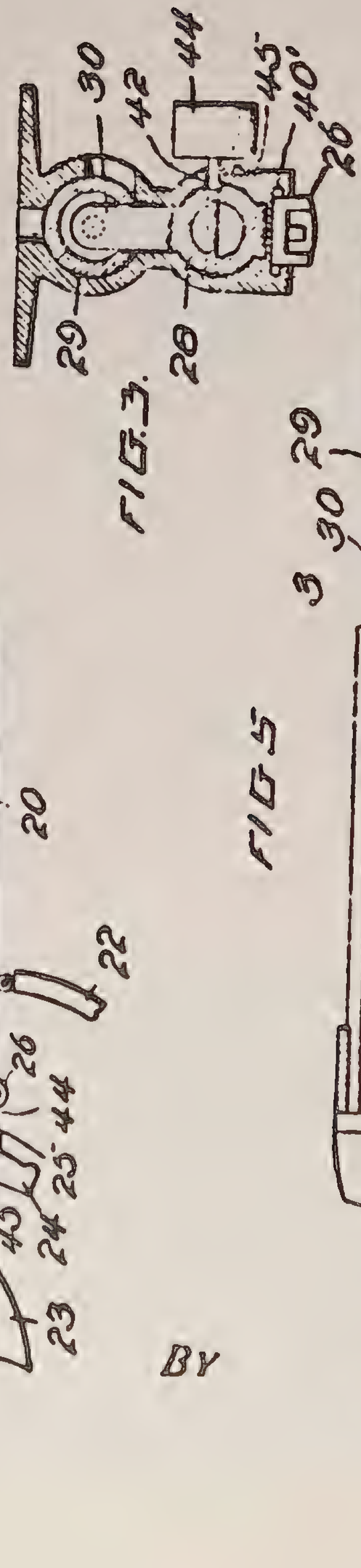


FIG. 3.

FIG. 4.

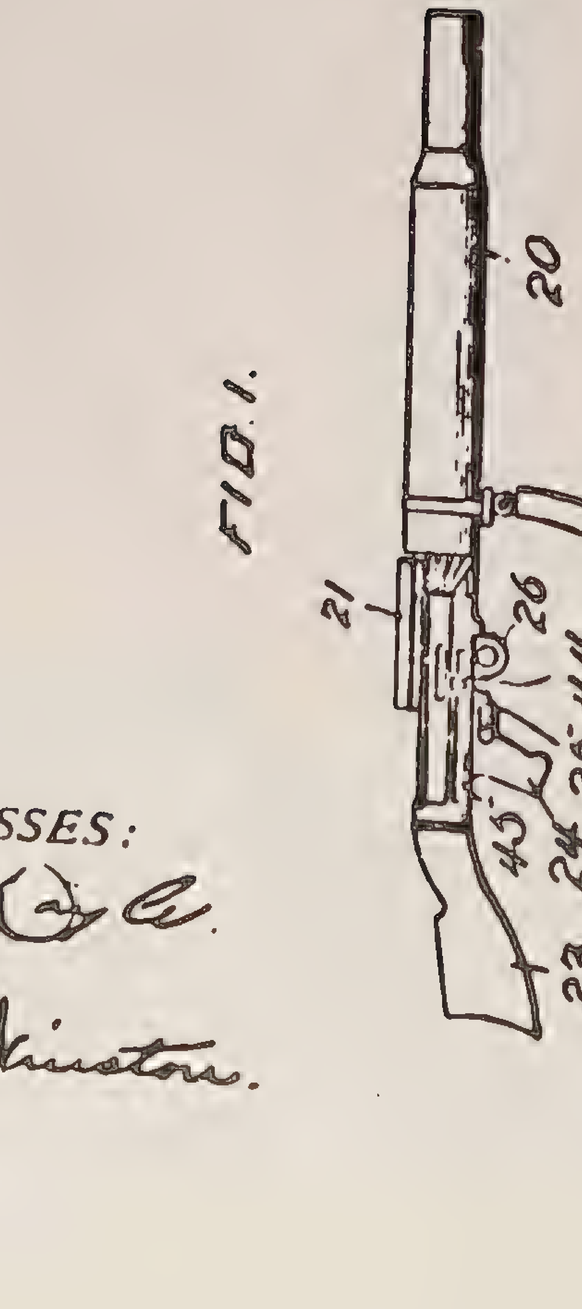


FIG. 1.

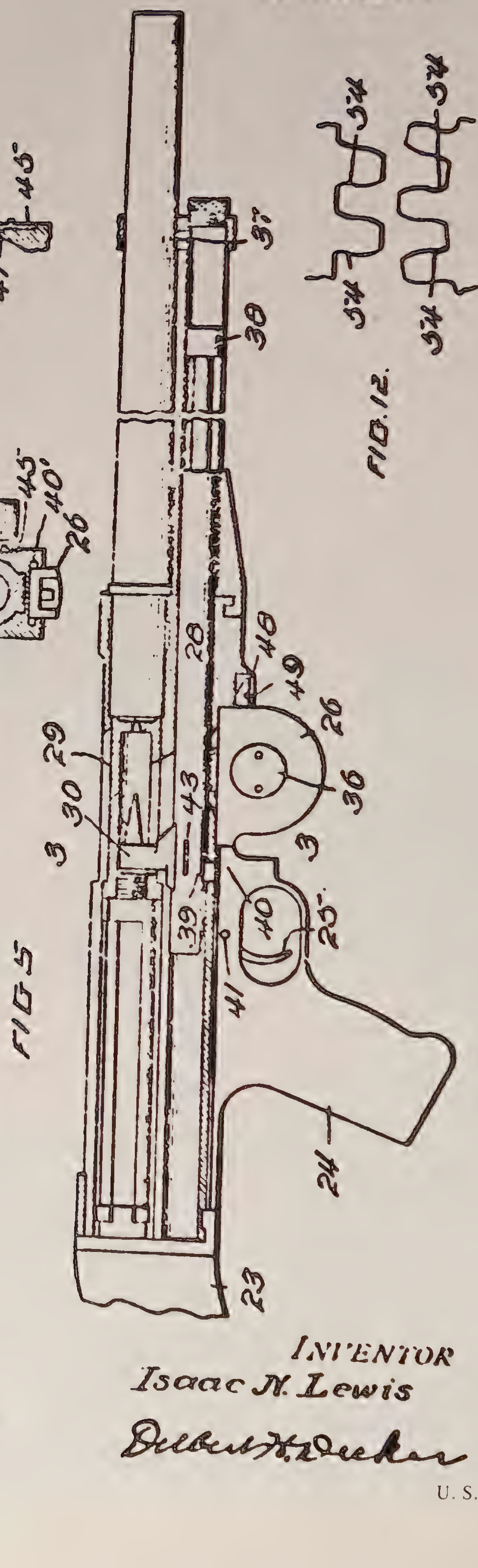


FIG. 5.

FIG. 12.

WITNESSES:

D. P. Winston.

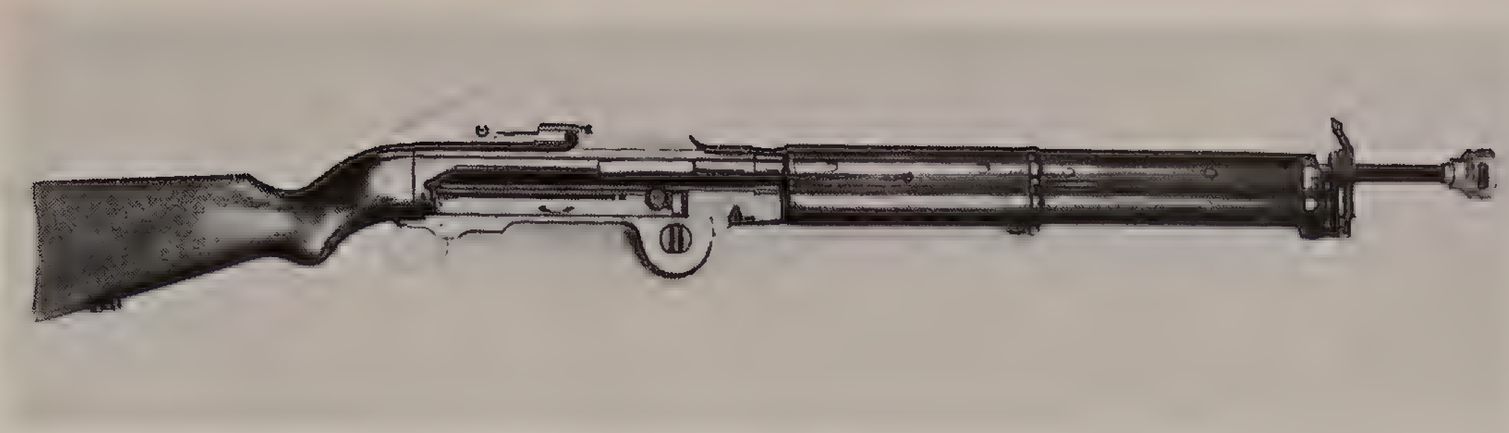
INVENTOR

Isaac N. Lewis

BY

Dickerson & Decker

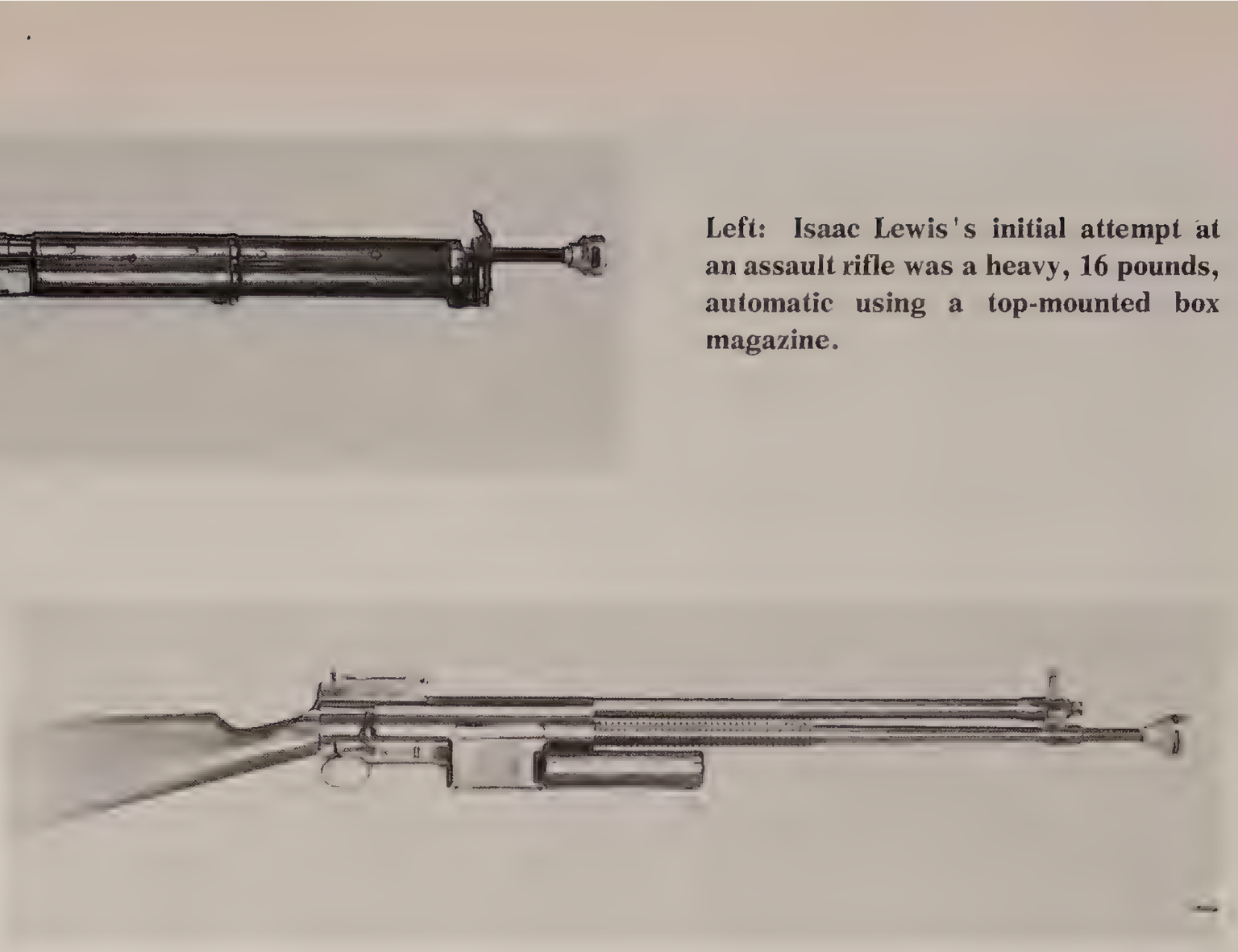
U. S. Patent Office



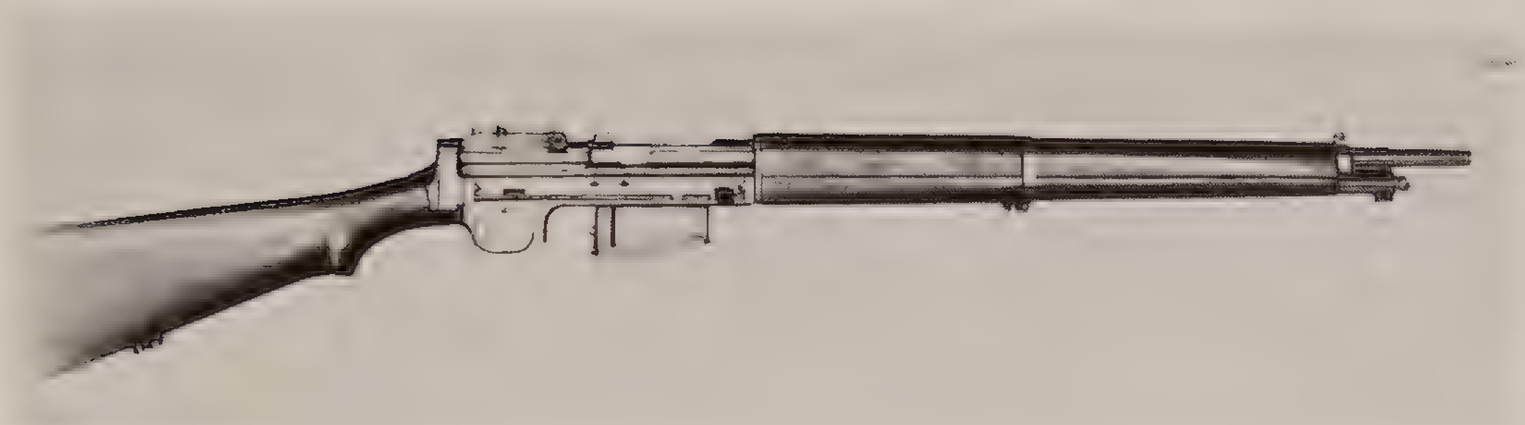
Savage Arms Company

Left: Isaac Lewis's initial attempt at an assault rifle was a heavy, 16 pounds, automatic using a top-mounted box magazine.

Right: Lewis-designed prototype automatic rifle weighed just over 14 pounds, used BAR-type magazine.



Savage Arms Company

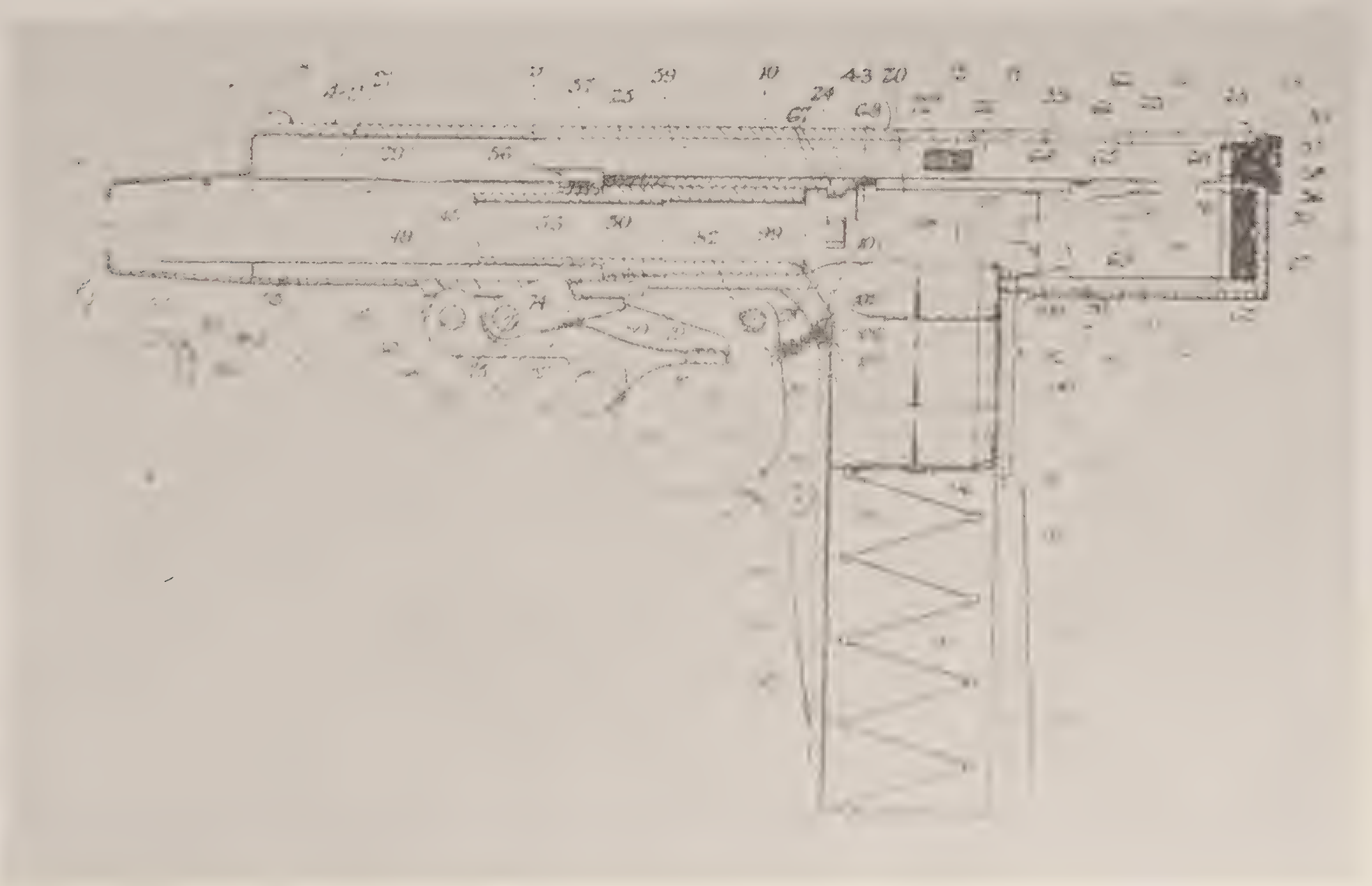


Savage Arms Company

Left: Semi-auto service rifle designed by Isaac Lewis just after WWI. Eight-pound rifle uses 5-shot stipper clip. Serialed U-1, this prototype never went into production.

Below: Isaac Lewis's last ordnance patent—an auto-loading pistol.

Following page: Isaac Lewis's friend... Army Chief of Staff Leonard Wood



U. S. Patent Office

National Archives

Smithsonian Institution

Paul and Bess Lewis

Richard Wheatley Lewis and his mother, Mary Lewis, in 1914.

Mrs. Thomas Kinahan

Col. I. N. Lewis in the side lawn of his Montclair, N.J. home, 1929.

Preceding page: Brig. Gen. James Allen, chief of the Signal Corps and a booster of the Lewis gun.

History has shown that during the latter part of his career, while stationed at Ft. Monroe, Isaac Lewis apparently began to realize his true value to the world of science. While his Army career was rising, Lewis was gaining much acclaim in scientific circles outside the military establishment. Isaac Lewis, the military man, came to enjoy an international reputation both in mechanical and electrical engineering.

Private industry had become interested in Lewis, for a second career following military retirement. One concern, the Automatic Arms Company, of Cleveland, Ohio, offered Lewis a part-time consultant's job, with the assurance it would not conflict with his army duties.

For some years, the fifty-two year-old officer had been considering ideas for a fully automatic light machine gun. He had seen Maxims during his trips to Europe, and he knew their ability in war. He had his own design concepts, as well as ideas for improvements in existing machine gun designs, and thus, the Cleveland offer seemed attractive to him.

Lewis agreed to work with the Automatic Arms Company, obtaining permission and conflict-of-interest clearance from the War Department. He was given a substantial share of the company's stock and resources to develop a light machine gun, using his ideas and/or any of a number of patents owned by the Automatic Arms Company. Among these were the patents of Dr. Samuel McClean.

3. Dr. McClean's Marvelous Invention

Although the ultimate design of the Lewis gun rests with Isaac Lewis, the basic invention was not totally his own concept. Many of the theories of this weapon are credited to Dr. Samuel N. McClean, a Cleveland, Ohio inventor.

Born in Iowa on 7 January 1857, Samuel N. McClean received his medical degree from the University of Iowa in 1885. He practiced medicine in Washington, Iowa for the next eleven years, until his increasing interest in ordnance development took him completely away from medicine. McClean left Iowa for Cleveland, Ohio in the 1890's.

McClean's initial ordnance patent was granted 5 April 1898. With financial backing from some wealthy Cleveland investors, Dr. McClean founded McClean Arms & Ordnance Company in 1900. By this time the forty-three year-old physician turned gun inventor was already a recognized figure in the ordnance research field, with forty-four U.S. and many foreign patents to his credit.

Working with an Army ordnance expert, the innovative Samuel McClean produced his prototype light machine gun. It weighed only nineteen pounds, and had fewer operating parts than the then-standard Benet-Mercie. Its inventor claimed that the barrel could be changed in half the time required by other machine guns.

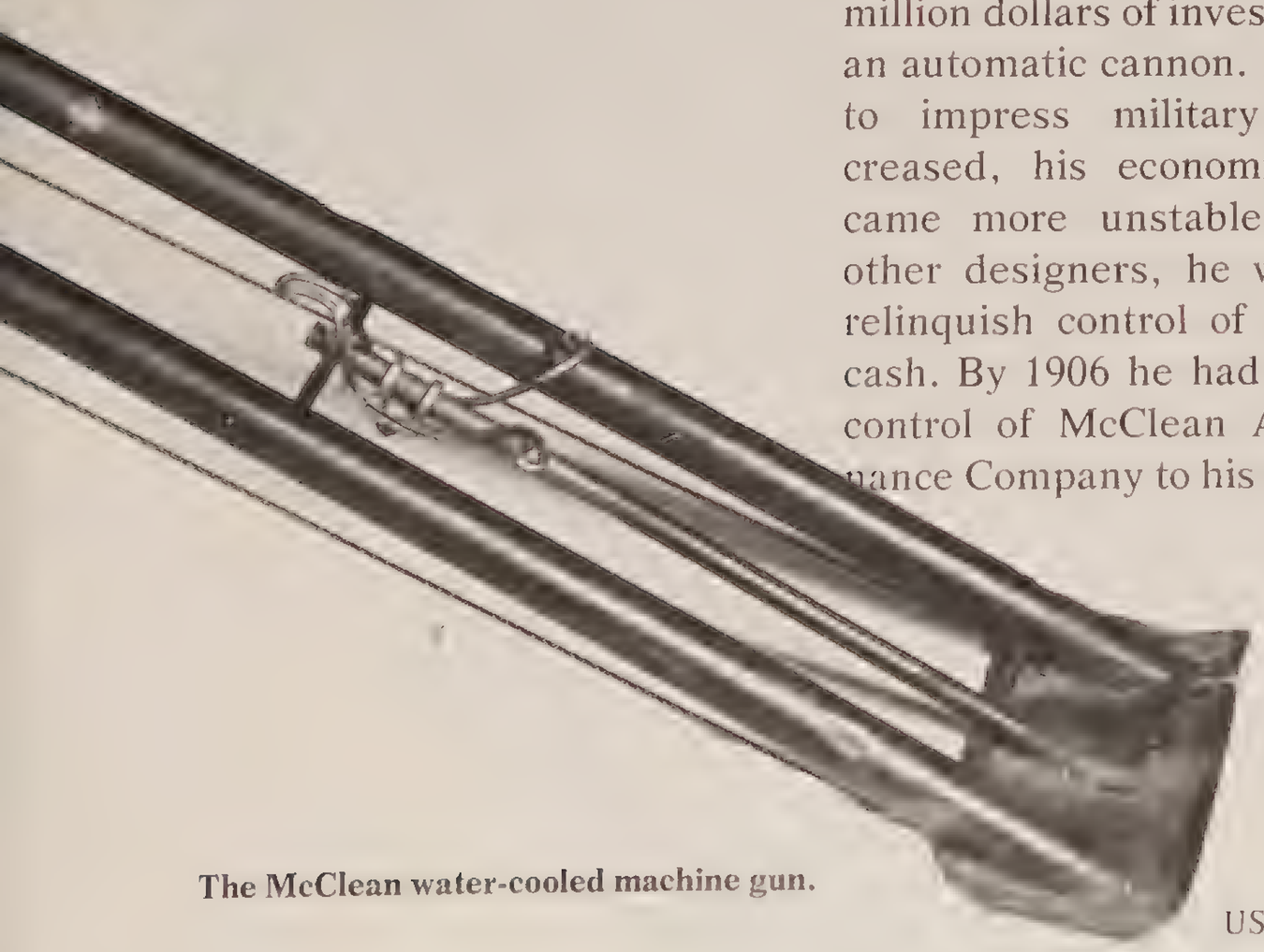
Discussing his invention with reporters, McClean said:

A machine gun is a noble thing as the mechanism which accomplishes the greatest amount of human destruction in the shortest possible time with the least difficulty.

The amazed reporters wondered how so much destruction could possibly be called noble. The smiling inventor explained that his device would shorten wars and create peace because of its awesome power. Said McClean:

Gentlemen, the machine gun may make war obsolete, for what rational man would throw his life away senselessly in front of one.

Samuel McClean spent several hundred thousand dollars on design development to perfect his machine gun, in addition to nearly a half-million dollars of investor money for an automatic cannon. As his failure to impress military buyers increased, his economic plight became more unstable. Like many other designers, he was forced to relinquish control of his ideas for cash. By 1906 he had lost financial control of McClean Arms & Ordnance Company to his investors.



The McClean water-cooled machine gun.

USMC

Late in 1907, five of McClean's financial backers, led by financier Morris A. Bradley, reorganized the management of the company and raised several thousand dollars needed to keep the business solvent. Early the following year, the management of the company brought two consultants to Cleveland: a premier ordnance salesman, Charles Dalley, and Isaac N. Lewis.

On 12 January 1910, the five major McClean stockholders, again led by Morris Bradley, wrote to the other investors in the company, announcing that the business was on the verge of collapse. One paragraph is of special interest:

Recently we consulted a leading ordnance expert who states, as his own opinion, that, while the guns produced are excellent ones, the company will be unable to do any business with our own government and that it has little chance of doing business abroad unless a satisfactory air-cooled machine gun is produced.

One could infer that the "leading ordnance expert" was Isaac Lewis, who at the time of the letter was involved in discussions with Robert Calfee, a Cleveland attorney, and Henry Rudd, an arms salesman with an international reputation as a wheeler-dealer; representing the McClean majority stockholders. Encouraged by Calfee and Rudd, Lewis had quietly started working on his own design for the air-cooled machine gun mentioned in the letter.

It appeared certain the McClean firm was rushing down the financial drain early in 1910, even as Calfee and Rudd met to discuss the future of the firm's holding and the McClean patents. Later, Rudd wrote Calfee that he had spoken with Lewis, who said he had, "...the best thing he ever heard of in connection with a machine gun."

HENRY W. RUDD
25 BROAD STREET
NEW YORK
CABLE ADDRESS "HERUDD"

May 26, 1910.

To the Stockholders of
The McClean Arms & Ordnance Company:

As you know I have been interested in a syndicate for handling foreign patents of The McClean Arms & Ordnance Company and have expended a large amount of money in attempting to effect a sale of the guns or patents abroad.

Now that the property of The McClean Arms & Ordnance Company has been foreclosed under chattel mortgages and certain guns models and patents have been purchased in an effort to protect money advanced, it has been decided to give the stockholders of The McClean Arms & Ordnance Company an opportunity to participate in the business that may be worked out of these purchases.

If the stockholders desire they may subscribe for an amount in the proposed organization proportionate to the amount of stock held by them in the old company and subscribers must agree to take and pay for such additional proportionate amounts as may be necessary in the judgement of the managers to successfully exploi the business. The understanding being that the amount already advanced for the exploitation of the business outside the company expenditures (approximately $50,000.00) shall be allowed in the new organization either in stock or in cash. If you desire to participate in such an organization please notify the undersigned on or before June 10th, 1910, at 25 Broad Street, New York City, as the opportunity to participate will not be held open longer.

Very truly yours,

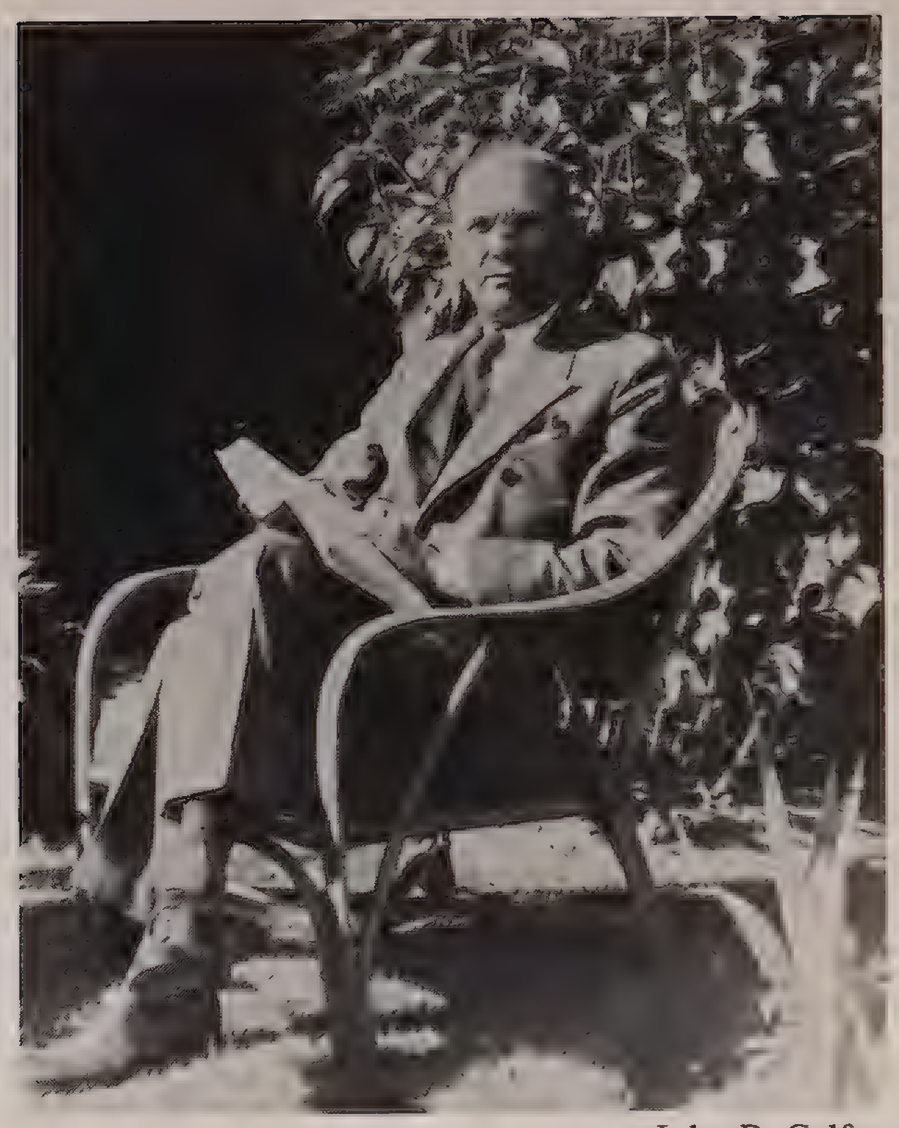
Henry Rudd.

John B. Calfee

Letter to reorganize the McClean interests into a new company.

Preceding page: Dr. Samuel N. McClean in 1906.

Right: Robert M. Calfee in the early 1960s.



John B. Calfee

Letter from Isaac Lewis to his friend Robert Calfee.

SAVOY HOTEL,
LONDON.

Dec. 8 1916

My dear Calfee:

Supplementing my letter sent you from Birmingham two days ago I am sending herewith an item you should have.

I am told positively that Hanson of P. & W. is in the direct employ of Colts and has been for some considerable time—in all human probability during the time he served as a member of the board.

This information is straight & may be acted upon. Hanson is in actual technical charge of the manufacture of the V-M output of Colts.

What a rotten game it is!

I shall write more at length later.

If Baker is credulous enough and unsophisticated enough to let Crozier execute that contract then he deserves to be shown up in Congress.

Cordially
Lewis

Dec. 8 1916

My dear Calfee:

Supplementing my letter sent you from Birmingham two days ago I am sending herewith an item you should have.

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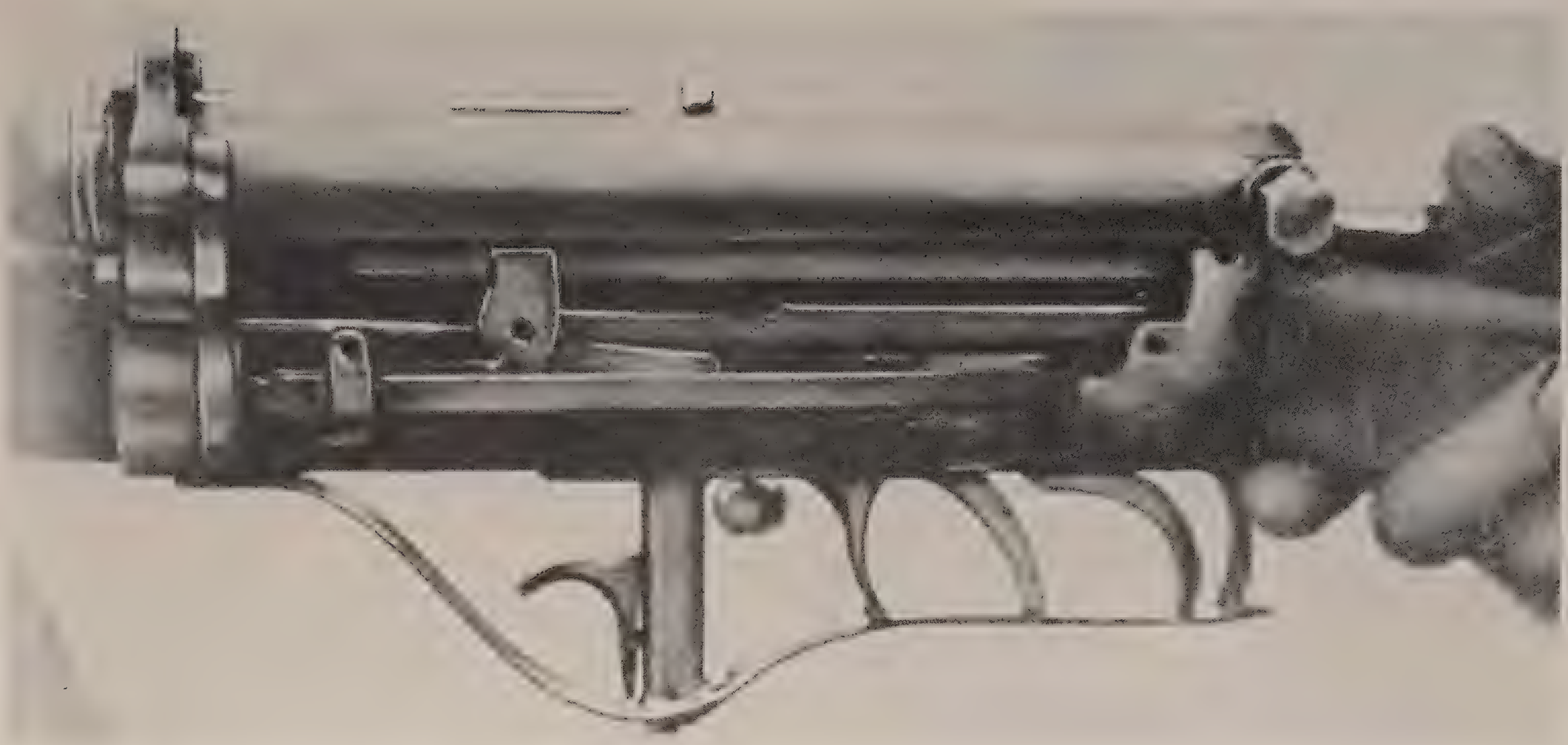
Cordially
LEWIS



National Archives

The two-trigger system of the McClean gun—one trigger each for full and semi-auto fire.

The air-cooled McClean Machine Gun with the odd side-mounted drum, as fired by its inventor.

National Archives

Late in April, Isaac Lewis and Robert Calfee met with the Cleveland money men behind the McClean reorganization. They discussed the reasons for keeping the ordnance firm alive and the sales potential of the Lewis development of the McClean patents. Isaac Lewis told them that he had just applied for a patent for his revolutionary air-cooling device for a machine gun. He wanted to use some of the McClean patents with certain of his own ideas to produce a brand new, air-cooled, light machine gun.

On 26 May 1910, Henry Rudd, now a company official, wrote an open letter to stockholders of the McClean Arms and Ordnance Company, indicating he was interested in salvaging the patents and prototypes of the McClean inventions and in forming a new company. His major interest, he noted, was in foreign development of the company's products.

By this time Samuel N. McClean had been literally forced from his own company. The unfortunate inventor, while a whiz at ordnance, was not a businessman. Financial backing ceased and his company went out of business. Then, under the leadership of thirty-four year-old legal genius Robert Calfee, and with the money of Morris Bradley, the business was reorganized under the name Automatic Arms Company.

Samuel McClean left Cleveland and took a job with General Motors, as a design engineer. Yet he never got completely away from the ordnance field, continuing to develop and test machine guns.

In 1920, McClean instituted a suit against Bradley, Calfee, et al, to recover damages allegedly due him in the transfer of his patents to Automatic Arms Company. He claimed it had been a fraudulent transaction and a conspiracy to steal his designs.

Although not named in the McClean suit, Lewis testified as a witness in March of 1922. Samuel McClean also testified, and in one portion of his testimony made strong inference that Isaac Lewis used many ideas from the McClean gun in his own Lewis gun.

Other witnesses completely demolished the McClean claim. The trial contained a great deal of technical testimony as to operating differences in weapon design, patent exclusions, and corporate law. In a plain, simple statement, Isaac Lewis demonstrated how the important areas of the McClean gun could be duplicated using common concepts unprotected by patents. His clear, precise testimony was a major factor in the court's decision, which went against Dr. McClean. The decision was appealed, but in 1924 the U.S. Circuit Court of Appeals refuted all the McClean claims.

While McClean's marvelous invention served as the basis for the Lewis gun, and many hundreds of thousands of dollars passed through the doctor's hands, only three known McClean guns remain today. One is in the Quantico Marine Museum in Quantico, Virginia; one is at the H.P. White Laboratories in Bel Air, Maryland, and the third is in the Savage Arms Company Museum. All are the large, water-cooled model machine guns.

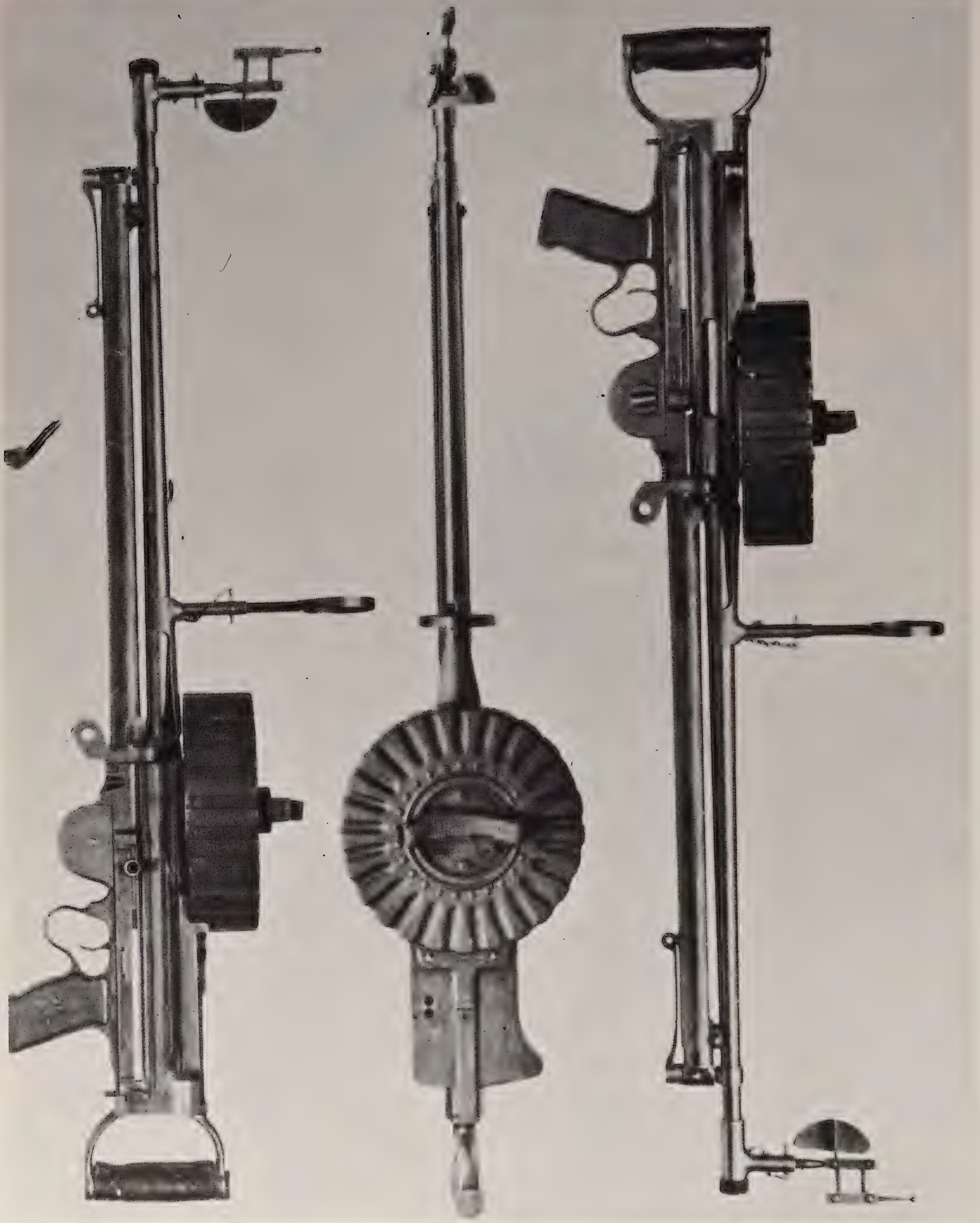
"The best thing he ever heard of in connection with a machine gun ..."

4. The Lewis Gun

Armourers and gunners check out Lewis guns prior to a mission in the Armourer's "tent" at a field in France. Actually, the "tent" was a frame and steel building.

"Air can cool as easily as water. I have plans for such a gun ..."

Imperial War Museum



Canadian Forces Photo

Aircraft model Lewis gun, .303

"There is no reason that an automatic gun has to be heavy ..."

Isaac Lewis and Automatic Arms Company formalized their legal agreements on 12 September 1910, detailing that the inventor would develop gas-operated guns. Interestingly, Isaac Lewis had the Article of Agreement specifically exclude air-cooled automatic machine guns from the section which directed him to turn all patents over to the company. Thus, the inventor retained control of his weapon-to-be. In exchange for his signature, Isaac Lewis was assigned one hundred and fifty shares of company stock, valued at $100,000.00.

By 22 September, Lewis and his new partners agreed that he would have a McClean gun for study, as well as design drawings. Former McClean machinist O. A. Huberty had joined Lewis earlier that same year. Huberty was later described by Lewis as, "the finest assistant and friend any inventor could ever be fortunate to have." Huberty stayed with Isaac Lewis throughout Lewis' active days.

Lewis had begun work on his new gun cooling system. The first person to see the Lewis developments other than the inventor and Huberty was Robert Calfee, who visited their small shop in Newport News, Virginia on 15 May 1910:

"I went to this small appliance shop to see what Lewis was up to," the attorney related. "He and Huberty had one of the McClean guns Rudd had given them, or at least it looked like one of the guns, except it had a big, round aluminum business on it."

Isaac Lewis recalled his first demonstration of the gun that day, writing, "I fired only about sixty shots before it heated up. The idea was fine, but the gun itself was wrong, so I had to do more redesign."

By the time Lewis and Huberty got the test McClean gun ready for real experiments, the whole project almost came to grief. According to the inventor, "...the cooling device was working well, but the gun ceased shooting after forty rounds." The inventor and his assistant worked, patched, stripped and tested. The gun simply would not fire. Dejected, they went back to their workshop.

Lewis discovered that the multiple holes in the barrel were sucking away the gas and not allowing it to blast open the action, the basis of a machine gun's operation. It was then he decided he would have to redesign the McClean gun even more, as it would not work with the Lewis air-cooling device.

Lewis and Huberty located a draftsman named Oches, and together the trio finalized the plan for the initial Lewis gun. At this point, Lewis was working on the design of a wholly new gun, although using some of the McClean patents owned by his stockholders.

By the middle of June, Lewis and Huberty had completed their new gun. The inventor finished design and testing that summer, and on 1 September 1910, he signed an agreement giving Automatic Arms Company the patent rights to his air-cooled gun.

J. Curtis Earl

Above: A group of Lewis gun drums with varying capacities.
Front row: Variations of the 47 round magazine
Back row: left to right:
1. 97 round drum
2 & 3 large capacity Lewis drums
4. McClean Gun drum

Below: Selection of spare parts and tools packed with Lewis guns.
Left to right:
1. Clearing Plug
2. Spare bolt assembly
3. Spare gas regulator Key
4. Gas chamber wrench
5. Drum loading tool
6. Barrel mouthpiece spanner wrench

Fred Hebditch, Jr.

J. David Truby

J. David Truby

Above, left: Lewis gun manufactured by Savage Arms Company

Right: BSA produced many Lewis guns for many nations, thus kept the top plate area open for the appropriate name.

Below: Carriers and loaders for the experimental 146-round drum Savage Arms Company designed for the Lewis gun.

J. Curtis Earl

Carrier and loader for the experimental 146 round drum manufactured by Savage Arms Company.

J. Curtis Earl

Right: Lewis magazine with experimental Veeder counter beside an adapter to mount ground model Lewis gun on M/1917 Browning tripod.

Following page: The Lewis gun storage cabinet in the armourer's building of a typical Royal Flying Corps squadron, including guns, spare barrels, ammo pans, sights, and various spare parts.

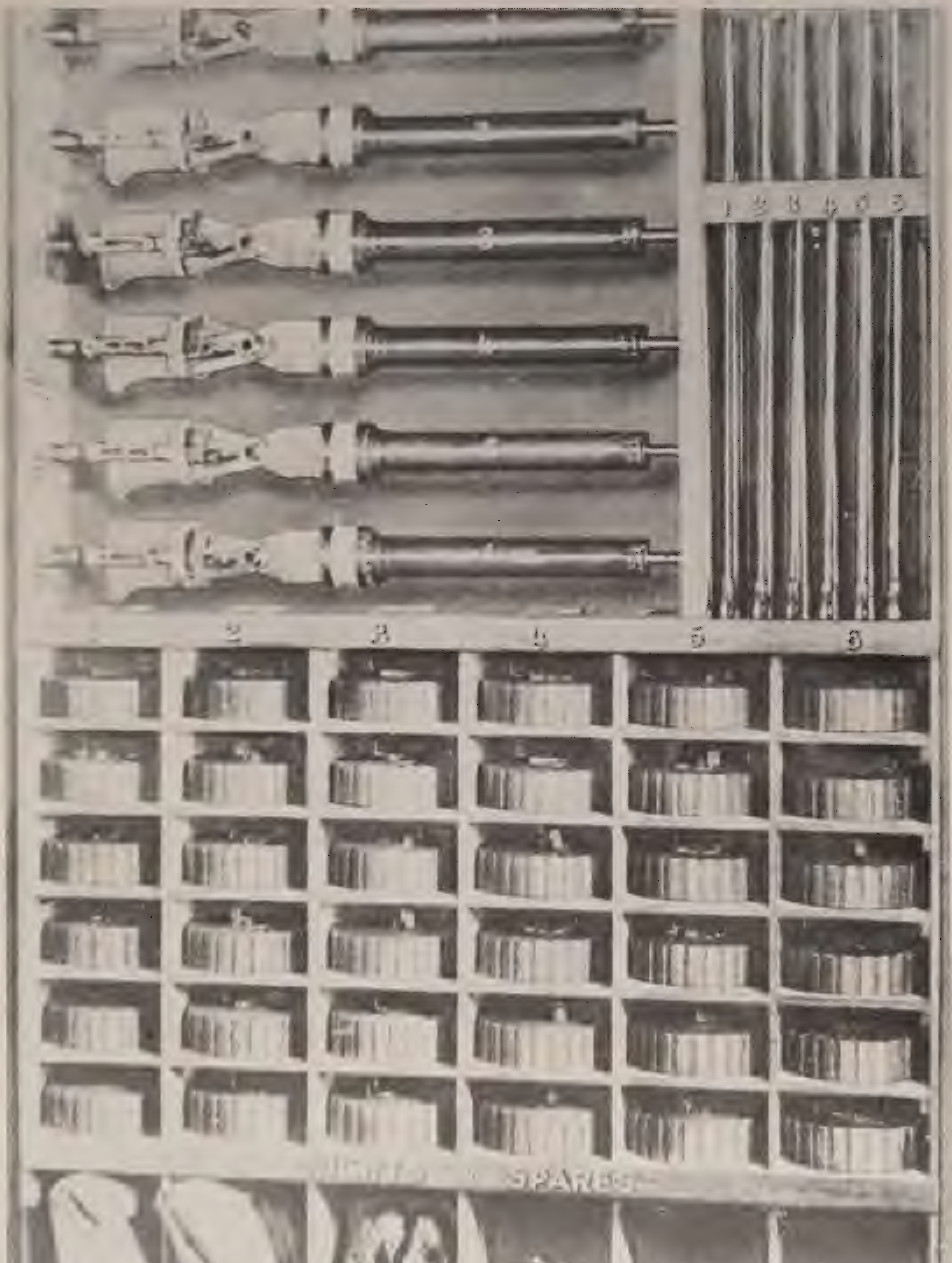
Savage Arms Company

Lewis drum carrier as used by the British Army.

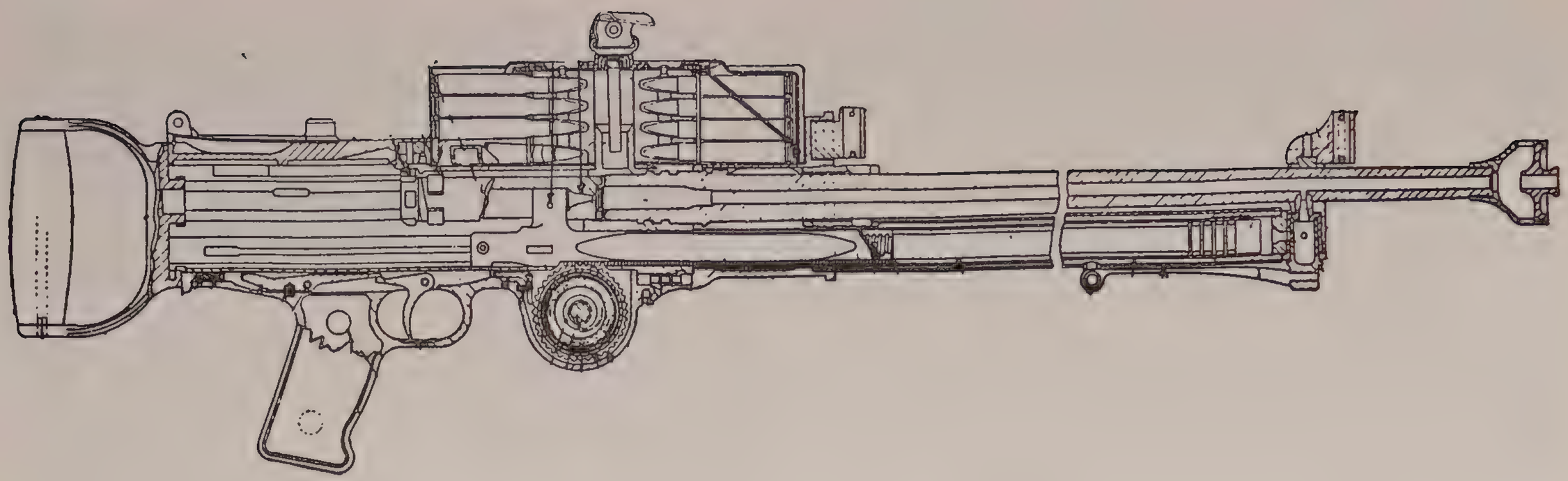
Dolf Goldsmith

British drum carrier with loaded drums

J. David Truby



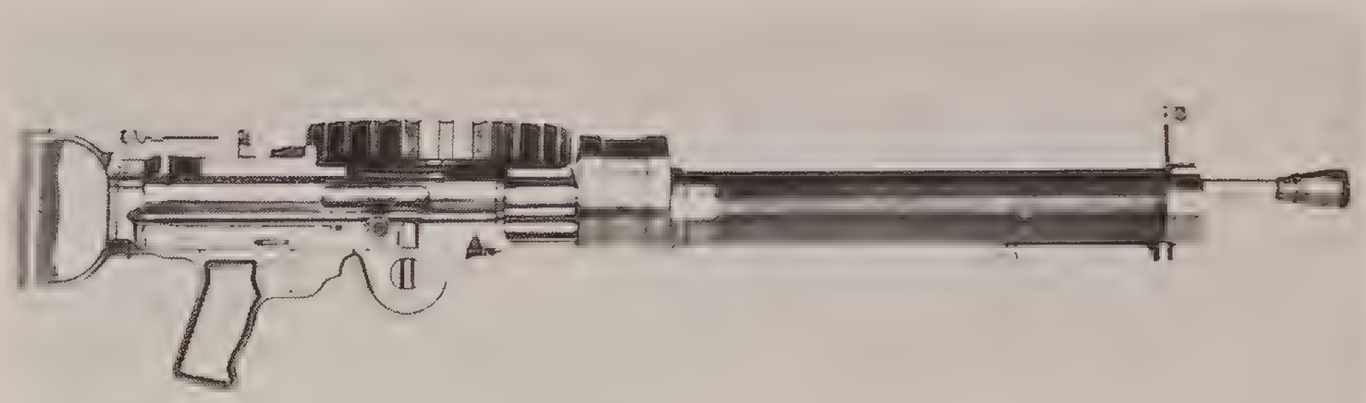
J. David Truby



Savage Arms Company

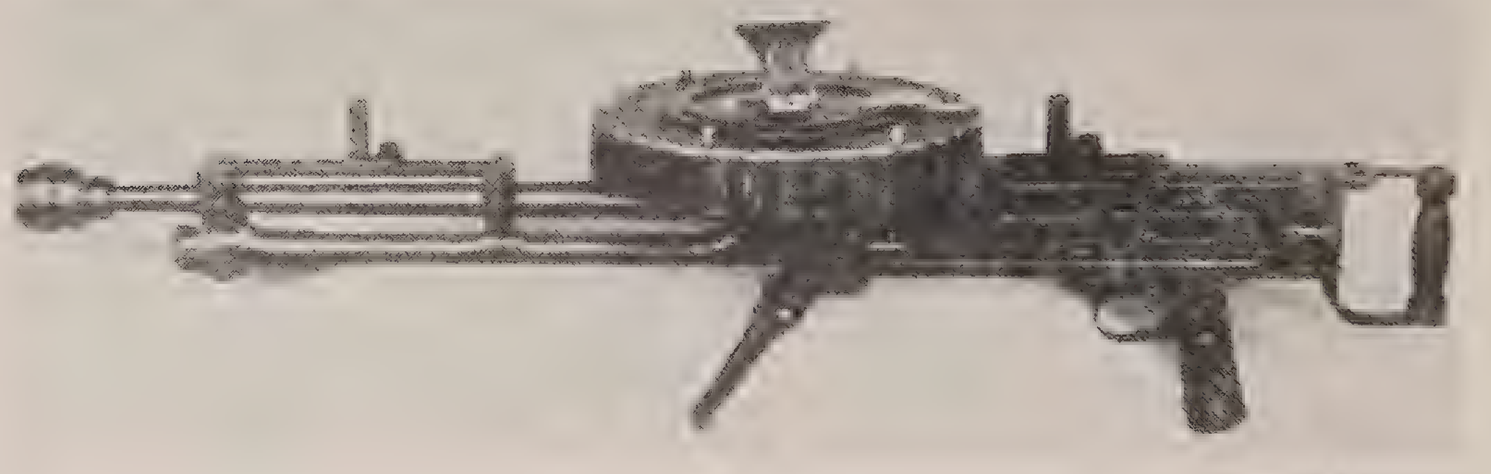
Above: Sketch of aircraft model Lewis gun manufactured by Savage Arms Company.

Right: Experimental .303 aircraft Lewis gun, lightened and modified by Isaac Lewis while working with B. S. A. in 1916.



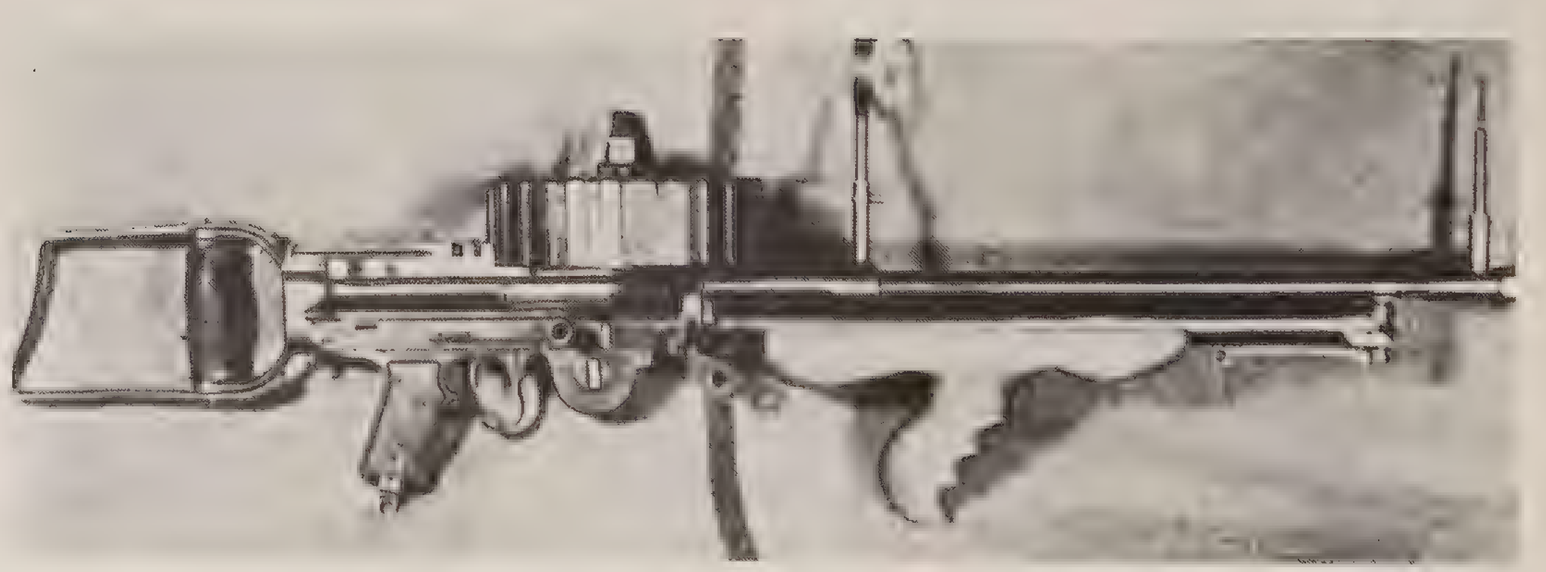
Savage Arms Company

An unusual Japanese model of the Lewis aircraft machine gun ... their copy was known as the model 92.



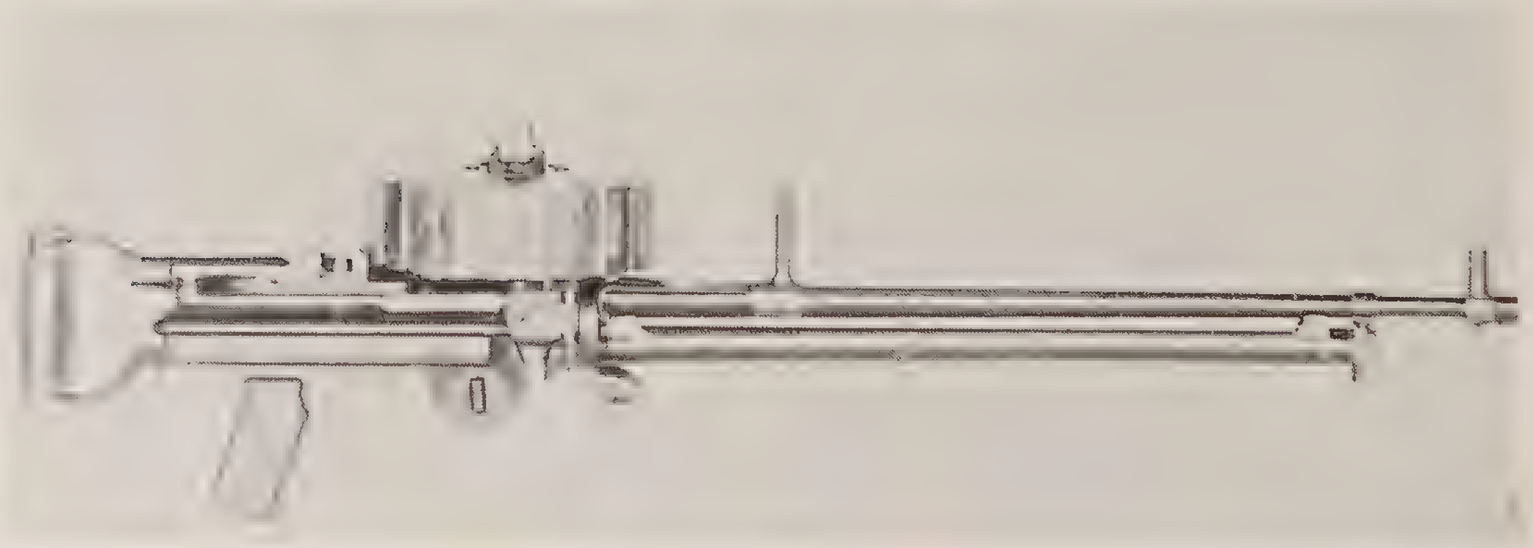
Donald Thomas

Aircraft Lewis gun modified by Canadian ordnance for assault use.



Canadian Forces Photo

Japanese Lewis gun taken from a Navy two-seat fighter during WWII

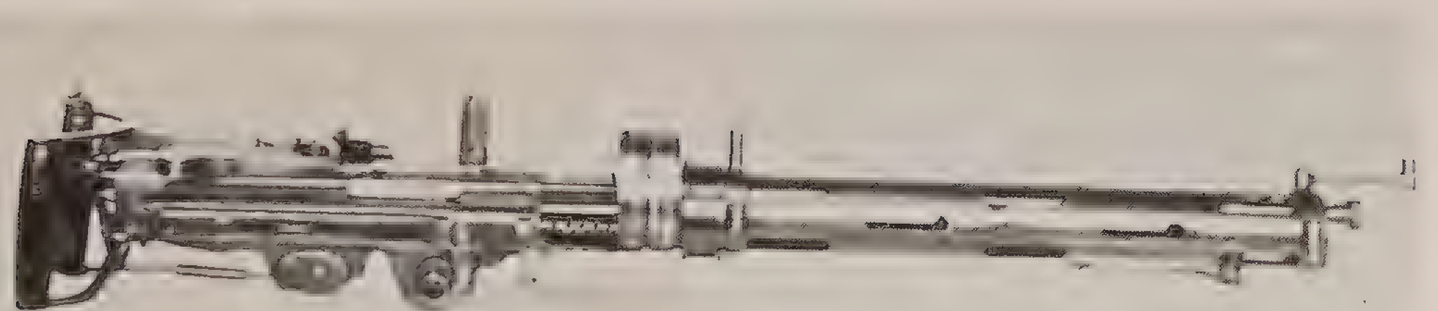


Charles Yust

One of a kind prototype ... a Dutch Lewis gun with folding stock.

Sgt. Maj. Oostdijk, Royal Military Academy of Holland

Aberdeen Proving Ground



Left: Dutch 7.7mm aircraft Lewis gun, model 1930.

Below: French Lewis gun used by Lt. Charles Nungesser's Nieuport Scout.

Bottom: A sectionalized Lewis gun used for training by the British.

J. Curtis Earl

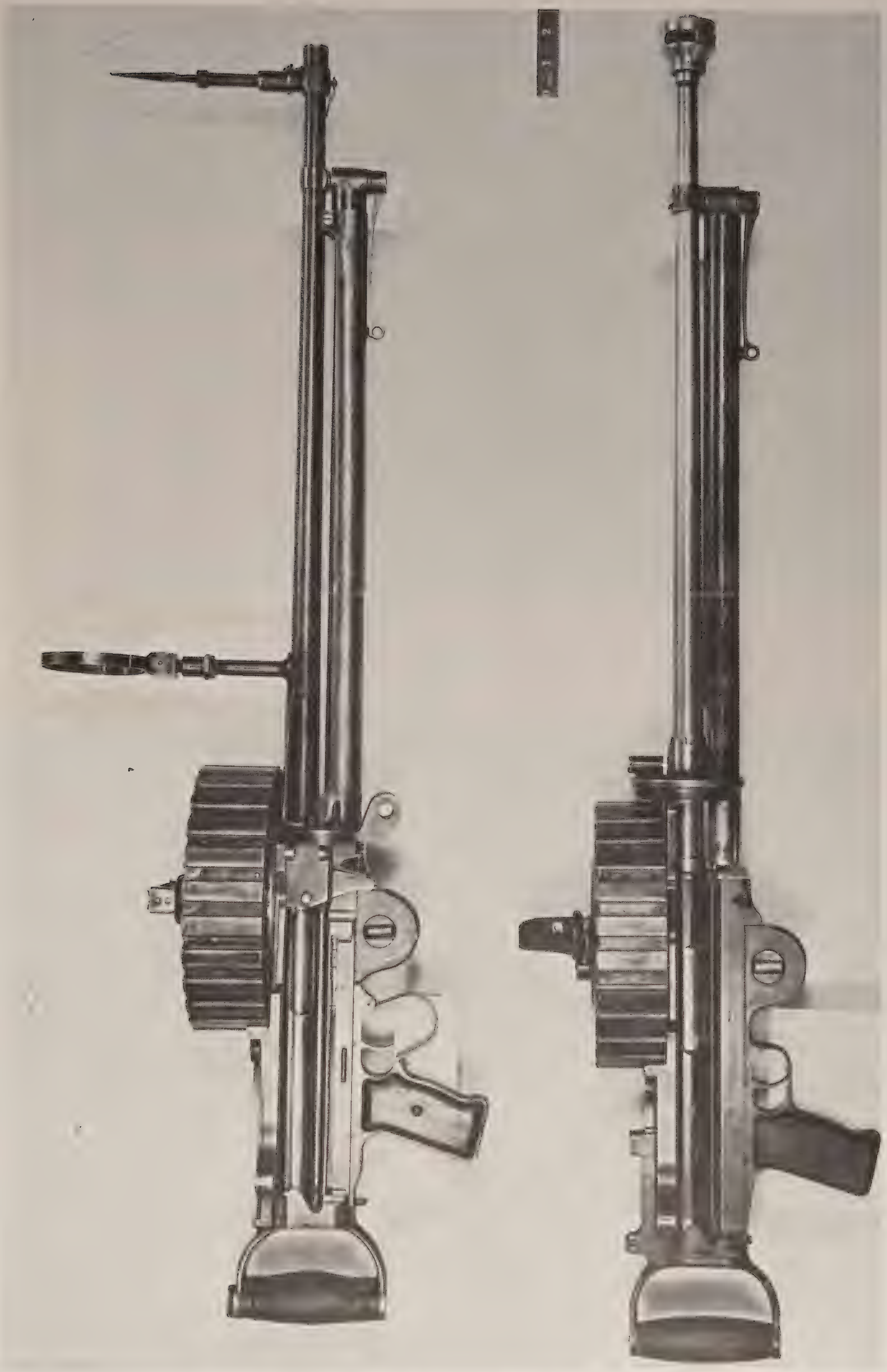
Imperial War Museum

USMC

Right side view of .30 calibre Lewis gun with bipod mount.

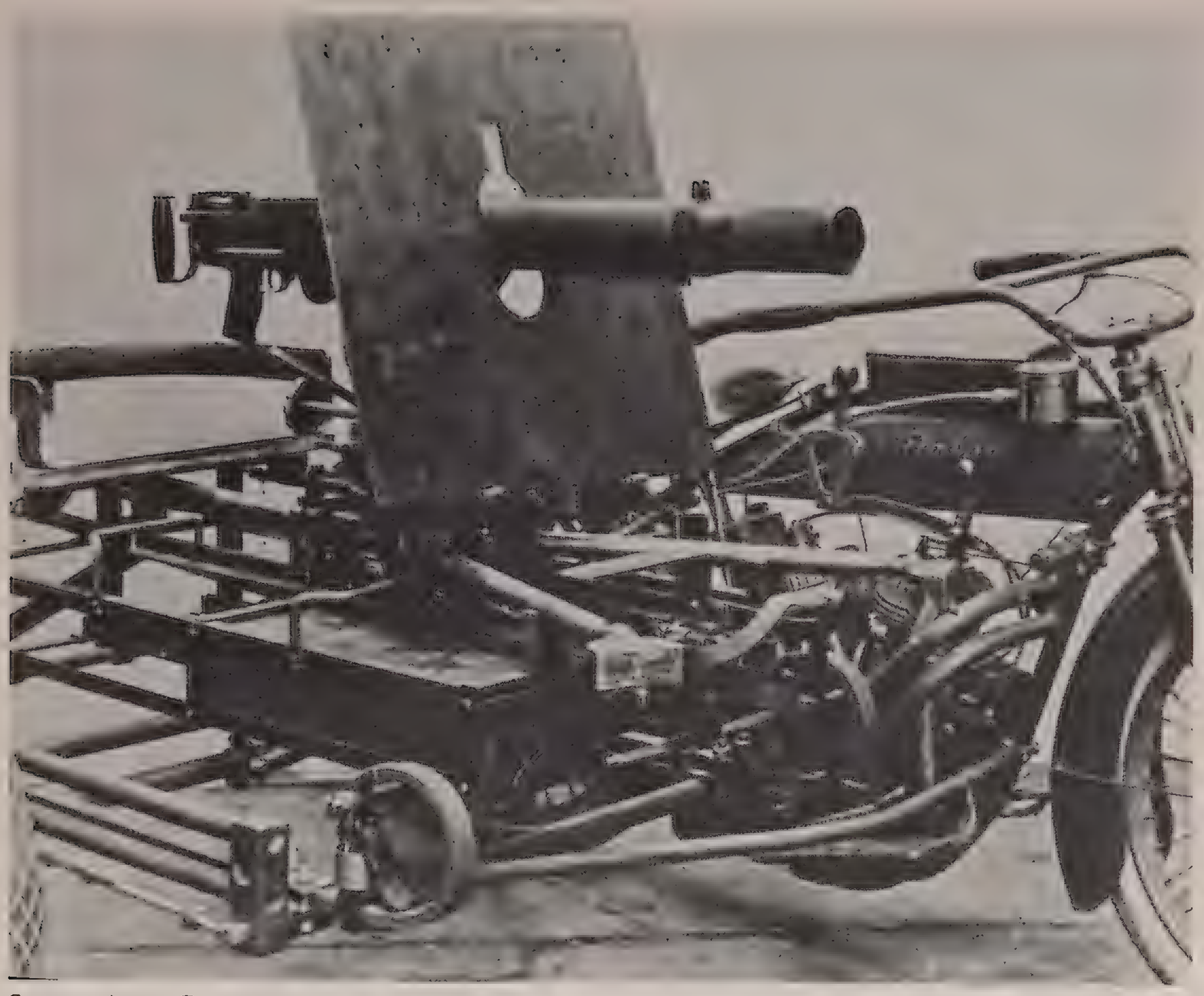
Left side view of the Lewis machine gun manufactured by Savage Arms Company ... cocking handle can be mounted on left or right side. Note the conical deck mount.

USMC



Charles Yust

The U.S. Aircraft Lewis gun as produced by Savage Arms Company.



Savage Arms Company

Left: The Lewis gun on a special mounting for use with an Indian motorcycle.

Below: Armourers of No. 1 Squadron in Palestine load drums and belts for the aircraft machine guns.

Following page, top: The armament section of the 166th Aero Squadron brought their Lewis and Marlin guns to France in 1918.

Following page, bottom: Armourers issue Lewis and Vickers ammunition to airmen of No. 22 Squadron at Vert Galand, 1 April 1918.

Australian War Memorial

The Merle Olmstead Collection

Imperial War Museum

Public Archives of Canada

A Canadian officer invented this mounting idea for the Lewis gun.

"Flying officers are overly impressed with the importance of their machines ..."

Early in the spring of 1911, Lewis had a handmade prototype built, and decided to unveil his machine gun for an old friend: Major General Leonard Wood, Army Chief of Staff. Lewis set a formal appointment, and the two old friends met on 28 June 1911. After presenting his invention, asking for an official test, and offering the weapon to the United States government, Isaac Lewis then asked his friend for, "off the record and personal advice."

Wood's reply was to call together some War Department officials and Army officers, and with Isaac Lewis, they fired the prototype weapon at the Ft. Meyer range, across the river from Washington. The hand-built weapon, using American ammunition, worked excellently. The officials and officers agreed that a formal test should be scheduled.

Lewis' leave came through in September 1911, by which time he had signed all rights in the Lewis gun over to the Automatic Arms Company. Of course, his offer of free weapons for his country still stood, at least as far as his interest was concerned.

By now Lewis had four prototype weapons, produced under a special arrangement with the Savage Arms Company. Automatic Arms Company had paid partly for the weapons, while their inventor had paid the balance. The cost was $1,200.00 per gun.

The first official test was on 2 May 1912, and it was, as the inventor admitted, "...an awful disaster. The weapon was almost an utter failure." In attempting to improve his machine gun, the inventor had actually weakened it, and it misperformed horribly.

The crestfallen inventor knew the problems and set about to alter the gun so it would fire successfully. But, he knew he needed more than just a mechanically perfect gun. For another public demonstration, Lewis knew he had to do something dramatic and news-catching.

Lewis realized that the most publicity appealing part of the Army was its new flying machines, and that the Signal Corps had a flying school at College Park, Maryland, just outside of Washington. The inventor hatched an idea that set a precedent for aerial warfare that lasts today: he put a machine gun in an airplane. The demonstration of the first use of a machine gun in an aircraft took place on 7 June 1912, and was a great success.

The rest, of course, is history. The aviators took the gun aloft and were enthralled with it. The follow-

"All I got was slapped with rejections by ignorant hacks ..."

ing day, the demonstration was repeated with photographers and newsmen present. The gun worked perfectly, as did its inventor, carrying on as chief salesman.

All, however, was not well. Stung by the wide public acclaim for Lewis' gun, Crozier's Board of Ordnance made oblique reply: an officer was quoted in the Washington papers, saying, "War in the clouds is a drama to ... young men. We have to give them their dreams, but little else. Flying officers are overly impressed with the importance of their machines. Lewis should know better than to misuse junior officers for his own ends, to sell his guns for private profit."

Lewis answered this charge by pledging that he didn't want one penny of royalty from his country for his gun. He told critics to accept the gun and he'd show them what he meant. When the U.S. finally adopted the Lewis gun in 1917, Lewis amplified his no-royalty pledge. He once told a colleague: "It's my way of showing my appreciation for the technical education I received from the government."

Still, in spite of his offer of 1912, Lewis' gun was rejected by the U.S. Disgruntled, Lewis—promoted to Colonel in 1913—set his retirement date for 20 September, and sailed for Europe; taking with him four prototype guns. He told friends: "I was an army officer for nearly thirty-seven years and devoted myself to my country's service ... all I got was slapped with rejections by ignorant hacks."

In Europe, Lewis' demonstrations fared well. Contracts were signed and production begun; first in Belgium, then on a much larger scale, in England. Later, as war needs surpassed production, British orders for Lewis guns were also placed with the Savage Arms Company, in the United States.

In 1914 Savage acquired an exclusive license for Western Hemisphere manufacturing rights. Due to problems Lewis was having with his Belgian partners, manufacturing rights in Europe went from Belgian interests to the Birmingham Small Arms Company, of England. By the time war erupted in Europe, Isaac Lewis was technical director of the Lewis Machine Gun Company of London; consultant to B.S.A.; president of Cleveland, Ohio's Lewis Machine Gun Company; director of the Automatic Arms Company; technical director and manager of Armes Automatique Lewis, of Belgium; and director of Societe des Armes Lewis, of Paris.

J. David Truby

Preceding page: Witnesses wondered why pilot Marcus Manton was laughing moments before taking the big Grahame-White biplane aloft to allow Lt. Stellingwerff to be the first man to fire a machine gun from an airplane in England.

Musee Royal Dr L'Armee Et D'Histoire Militaire De Belgium

Close-up of Lts. Stellingwerff and Nelis during their historic flight.

The initial aerial firing of a Lewis gun in Europe, in the Fall of 1912 in a Farman-Voisin aircraft. Lt. Nelis was the pilot, while Lt. Stellingwerff fired the Lewis gun.

Musee Royal De L'Armee Et D'Histoire Militaire De Belgium

5. Production

Lewis gun production got rolling just in time to meet the opening shots of the first World War. Ten guns were purchased by the British Admiralty and the War Office in July of 1914. Within two weeks another order went out for forty-five Lewis guns for the Air Service. Within another fortnight, B.S.A. picked up contracts for 200 more Lewis guns, to be delivered at the rate of twenty-five per week. Toward the end of that year, an additional 400 Lewis guns were ordered for general service. The initial contract price was 175 pounds sterling, or $794.25. However, according to B.S.A. figures, the development cost was nearly $2-million.

B.S.A. soon had to purchase additional land for expansion of its manufacturing plant, and with additional buildings, more Lewis guns began to flow toward the front lines. According to line officers, this initial production gun was perched upon the fifty-six pound tripod used for the heavy Vickers. The Army originally used them as battalion guns, mounted on the heavy Mk.IV tripods. This was discontinued because the large tripod robbed the Lewis of its two advantages: mobility and concealability. A light bipod, weighing two pounds, was designed by B.S.A.

B.S.A.—even with expansion—could not produce the Lewis gun fast enough to meet military needs. Early in 1915, War Ministry officers met with Colonel Lewis and B.S.A. officials in order to increase production of the Lewis gun. By March of 1915, after an order for 400 guns, the three agreed to a contract that called for the production on a minimum of 100 Lewis guns per week, with no termination date.

An additional contract was placed in May for 2000 more Lewis guns, with spare parts, delivery to be made at the rate of 100 guns per week beginning 6 September 1915. This contract was arranged on the basis of $750.75 per weapon. Of this amount, $455.00 per weapon was assigned to the Automatic Arms Company in royalty payments, made largely to Isaac Lewis.

During this early period B.S.A. was producing Lewis guns for other countries, including Belgium, France and Russia. It was a lucrative financial situation: the Russian government paid $910.00, or 200 English pounds per weapon, while France spent 5000 francs for each Lewis gun. The Belgians also paid 5000 francs per gun, and Isaac Lewis received copious royalties on these sales.

Increased production meant more manufacturing equipment, and within two years from its first contract, B.S.A. had assembled more than ten thousand machine tools for turning out Lewis guns. According to official reports, most of these machines were run by women, who were "...highly skilled and competent mechanics."

B.S.A. officials boosted production to three hundred guns per week by the end of the year, and had the figure up to five hundred Lewis guns per week by the following March. A new contract was negotiated shortly before the final delivery date of the 10,000 Lewis guns, whereby output was extended

Charles Yust

Anti-aircraft mount for Lewis gun as used in 1917.

to 750 guns per week, with the contract to run for the duration of the war. As with the other contracts, the Ministry made a cash advance to B.S.A. for equipment.

As the fourth summer of the great war saw its first American combat troops, American industry rolled up its sleeves to enter the battle. According to *Iron Age* magazine, by June of 1918, the War Department had delivered 2000 Browning Automatic Rifles, 2500 Lewis guns, and nearly 10,000 heavy machine guns, including Colt, Browning, Hotchkiss, Maxim and Vickers. In addition, according to the *Iron Age* report, 4500 aircraft Lewis guns had been delivered, compared to nearly 16,000 of the Marlin aircraft gun.

The initial contract for large scale production of the .30 caliber Lewis guns was not made until May of 1917. The cost was agreed upon at $239.89 per gun.

When the initial U.S. order was placed, the Savage Arms plant was completing a British/Canadian contract for 12,500 Lewis guns in .303 caliber, to be delivered at the rate of about eighty per week. As the company was also equipped to produce the .30 caliber version of the weapon, there would be few of the usual "tooling up" delays.

In Savage's Utica plant, each Lewis gun was first carefully inspected and service tested by experienced engineers. The guns were then completely disassembled. As each gun was taken down, every part was carefully weighed and measured, and if any part showed a variation exceeding .003" or a correspondingly small variation in weight, it was rejected. The parts that passed the tests were then placed in boxes. In re-assembly, care was taken to select the parts for each gun from different boxes, assuring perfect interchangeability.

The guns were then taken to the firing ranges on the roof of the factory building. The ranges consisted of sheet steel tubes, three of which were 100 yards in length, and the others 100 feet. They were used to determine the ability of the gun to maintain accuracy under rapid-fire conditions. Army officers of the Allied governments were in constant attendance at these ranges, noting every action of the gun under test. By the summer of 1917, these ranges were working 24 hours a day under three shifts of Army inspectors. These roof-top tests were known as "rigid tests."

These were tests of the accuracy of the gun and not of its gunner. The gun to be tested was clamped at four places along its length to a heavy cast-iron table capable of being elevated and traversed. The table was firmly mounted on a heavy concrete base. Once the gun was aimed, any dispersion of the shots as shown on the target was due to the gun or the cartridge, and such dispersion was regarded as an absolute record of the accuracy of that Lewis gun. If any gun did not hit the bull with at least 75 percent of its shots, it was rejected.

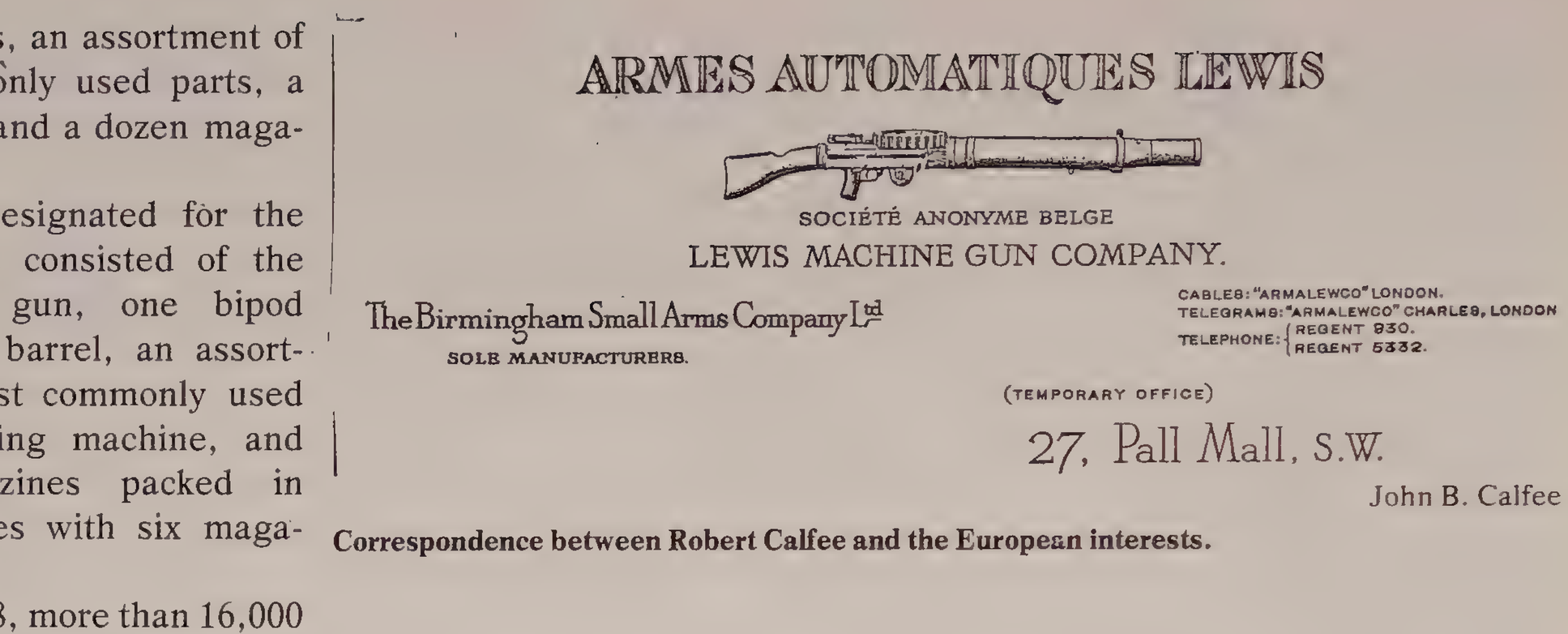
The outdoor testing facility was located about three miles outside Utica near what is now Route 5-S. The land, then owned by Savage, was a 1000 yard range, where firing was directed from an observer's cabin built atop a squat concrete tower. From this cabin, targets could be played out to, shot at, and observed at varying ranges up to 1000 yards. In addition, the cabin served as a vantage point for military officers who wanted to watch assault and other field tests being carried out on the range. Today, all that remains of the once-thriving facility is the crumbling concrete tower now partly buried in underbrush.

After the final testing, each weapon and its accessories, termed a "Lewis outfit" by the plant personnel, was packed for shipping. An "outfit" to be shipped to the British or Canadians consisted of one gun with both the regular butt stock and spade grips, a light field mount,

two spare barrels, an assortment of the most commonly used parts, a loading handle, and a dozen magazines.

An "outfit" designated for the American forces consisted of the following: one gun, one bipod mount, a spare barrel, an assortment of the most commonly used parts, one loading machine, and thirty-six magazines packed in ammunition cases with six magazines per case.

By May of 1918, more than 16,000 Lewis guns had been delivered. Over 10,000 of these were of the aircraft type; the other 6,000 were delivered to the Navy for Marine Corps use. By August 1918, 25,000 of the aircraft type had been shipped, and by Armistice Day, 34,000 of that model had been delivered.



Correspondence between Robert Calfee and the European interests.

Following page, top: The B. S. A. plant which produced so many Lewis guns.

Following page, bottom: The assembly line at Utica's Savage Arms Company plant, where workers handled barrel assemblies.

Four different types of Lewis gun mounts produced by Savage Arms Company.
Top: This is the "Light Folding Field Mount" for the Infantry Lewis.
Bottom: Three mounts for mounting the Lewis on vehicles or aircraft.

J. Curtis Earl

B. S. A.

Savage Arms Company

A. E. Scherer

An exceedingly rare weapon—an original Russian Lewis gun. Today, the Soviet government denies that Lewis guns were ever used in that country—before or after the Revolution. This weapon is proof to the contrary.

Following page, top: A Russian ground model Lewis gun—quite a rare trophy in anyone's collection.

Following page, bottom: A French Lewis gun mounted to a periscope for firing from the trench.

Markings on the BSA-manufactured Russian Lewis gun.

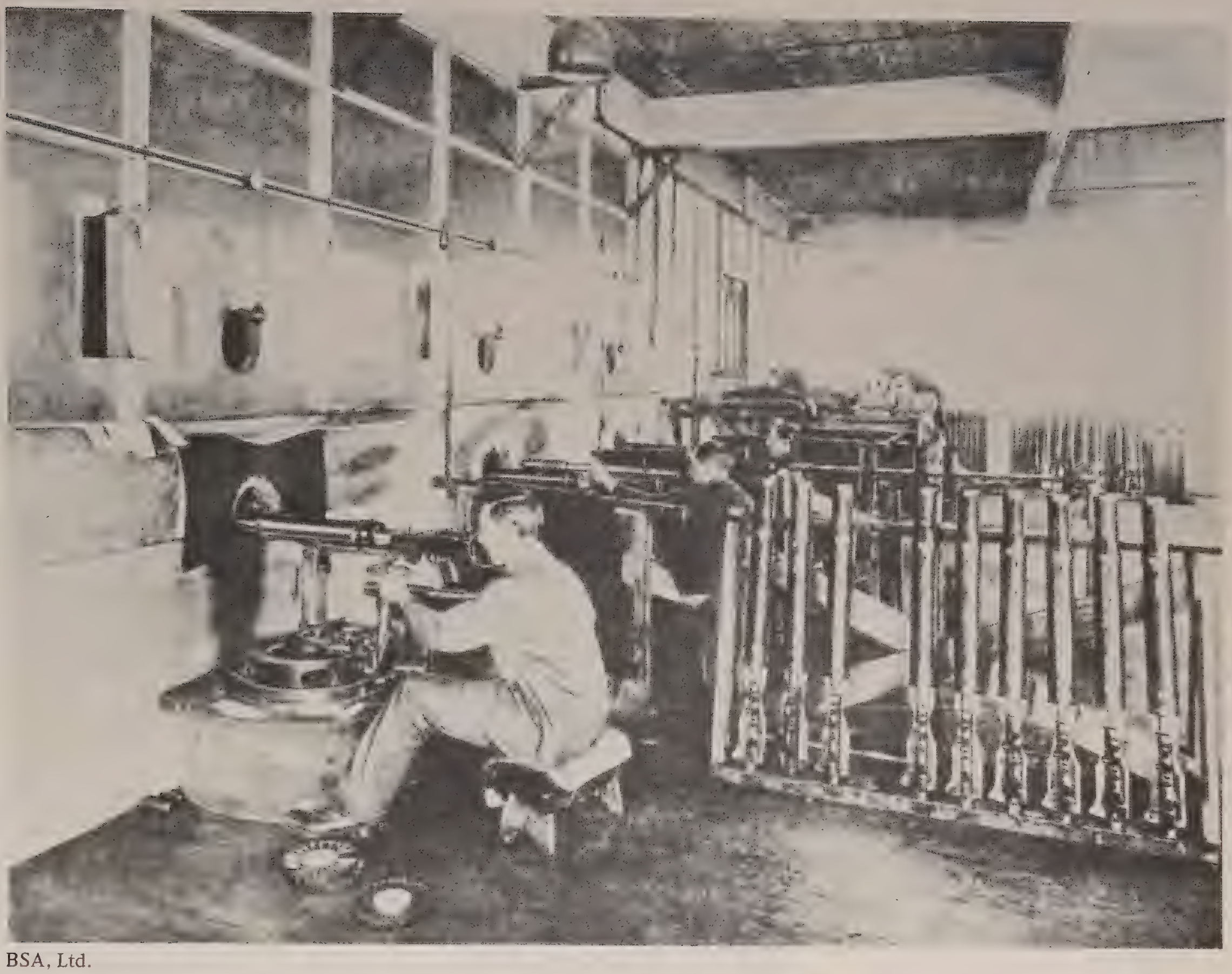
A. E. Scherer

A. J. Scherer, Jr.

John A. Minnery

Savage Arms Company

Savage Arms Company



BSA, Ltd.

Savage Arms Company

Above: Testing Lewis guns on the enclosed 100 yard range at the top of the BSA factory.

Right: The fixed target at the end of the firing tunnel on the roof of the Savage plant.

Preceding page, top: The Lewis gun fixed to a steady mount ready for firing into the roof-top tubes. The inventor, Col. Isaac Lewis is on the right.

Preceding page, bottom: The firing tunnels on the roof of the Savage plant, where fixed firing tests were performed on Lewis guns.

6. "Ready On The Firing Line ..."

The Public Archives of Canada

Canadian gunners learned deflection shooting at School of Aerial Gunnery, Beamsville Camp in Ontario.

Late in 1915, the British High Command realized the allies were fighting an army skilled in machine gun tactics, whose gunners were highly trained. Because the Lewis gun was a new weapon with a new tactical concept, something had to be done immediately to even the odds.

A machine gun school was founded and the Lewis gun was selected as one of the weapons for initial training. The Lewis gun was chosen as a weapon eminently suited for infantry and did not require special intensive training as did a heavy machine gun. According to British ordnance experts, any soldier of average intelligence could learn the mechanism of a Lewis gun in a few days.

Both Isaac Lewis and B.S.A. officials cooperated with the British military in setting up a curriculum and a facility. A class of insturctors was hurriedly trained, and they passed their skills along to other instructors, until a cadre of skilled Lewis gun instructors was assembled at the so-called Lewis gun School, Le Touquet. The location was chosen because it was close enough to the front to easily transport troops from the fighting to the school and back to the fighting again, as qualified Lewis gunners.

One British training officer likened the use of the Lewis gun to a submarine. He noted that in a long range face to face shootout between a German Maxim and a British Lewis, the Lewis will lose, just as a submarine will lose a similar encounter with a heavy battleship. He told the trainees that the Lewis, like a submarine, must pop up at surprise moments, hit hard, do its damage, then escape by virtue of its mobility to some other place where "...the deadly dose of the Lewis can be repeated."

Imperial War Museum

An officer "gunnery student" takes his advance training at the Ran-du-Flers-Verton Gunnery School in France, July 1918. This observer is firing at a fixed target from a "cockpit" moving along curving rails.

USN

Navy enlisted men learn the Lewis gun on the range at the Naval Station, Caldwell, N. J., in 1920.

One graduate of the school later outlined the basic values of the Lewis, given as introduction to each new gunner attending the school:

1. It can be brought up promptly to any point where additional fire is required.
2. It can be taken into action by one man.
3. It is essentially adapted for close support of infantry, and its tactics are practically those of infantry. It can go, therefore, wherever an infantry attack can go.
4. It requires no emplacement, but can be fired over a parapet, out of a shell-hole, or from the ground.
5. It can be slung upon the back, or carried on the shoulder, like a rifle, and so be got into position undetected.

A class receiving instruction on the Lewis gun from the 12th Training Battalion in Hurdcott, England.

Australian War Memorial

Other Commonwealth armies conducted formal Lewis gun training. According to official records, the Australians averaged 80 percent of their line company personnel passing a qualifying course of instruction with the Lewis gun.

The initial American machine gun instruction was forced upon the U.S. military by the decision to chase Pancho Villa. That summer of 1916, a settlement of Army tents sprang up outside El Paso, Texas. It became a primitive training facility. Initial machine gun training was also given at the School of Musketry, Fort Sill, Oklahoma. As there never was an adequate supply of ammunition, most gunners had very little firing experience.

Two-week courses turned out two machine gun companies each cycle. These courses operated nearly nine months, ceasing operation in April of 1917. Because of the success of the school and its graduates, the Army established a more permanent facility at Springfield Armory, where it taught the theory and techniques of all the machine guns to graduates of the nation's engineering schools. The first class, mostly graduate engineers from M.I.T., were commissioned as ordnance officers and sent to various training camps to teach men the why, what, and how of all machine guns.

By war's end, 511 officers had graduated from the Machine Gun School. In April of 1918, after the school was transferred to Camp Hancock, Georgia, it sent out 353 more trained armorers and expert instructors in all types of U.S. machine guns. According to the records of Army instructors, the Lewis was an easy gun in which to instruct recruits, and most reports claim the simplicity of the Lewis was ideal.

Wartime training became more detailed, as instructors would mix up parts for the aircraft and ground model guns. Each blindfolded student became efficient at handling this situation, and according to a field report, "Most of these stu-

Australian War Memorial

Australian troops prepared for Japanese invasion by bringing old Lewis guns out of retirement for their second world war.

Following page, top: Motorcycle volunteers in England trained with the Lewis gun.

Following page, middle: Marines train with Lewis guns, San Juan, Cuba, in April of 1918.

Following page, bottom: Naval gunners learn how to fire the Lewis gun during parts-orientation class at Great Lakes Naval Training Center in the summer of 1920.

dents become as familiar with the weapon as they have been with their own fingers and toes." To prove the theory, students regularly ran the blindfold test in front of newsmen and other witnesses.

In addition to the general training given infantry and Marines, special considerations were given to aerial use of the weapon. This was the original role Isaac Lewis had in mind when he had first demonstrated the weapon several years earlier.

A gunnery school at San Leon, Texas began almost overnight, in the spring of 1918. Under the direction of Capt. W.R. Drexell, it was 100 percent operational in a week and became a very efficient gunnery school for the U.S. fliers who went to France.

Initial gunnery practice was at small targets floated on bobbing bouys in the bay. Other ground training with the Lewis included firing at "surprise" targets much the same as the pop-up targets used by infantry basic trainees.

The silhouette target was used as the first real flying stage in aerial gunnery. The cadet went up in an aircraft to fire at a target in the water under simulated combat flying conditions. For example, his gun would jam, and while he was making the proper adjustments, the pilot would be skidding, side-slipping, and zooming.

B. S. A. Ltd.

National Archives

USN

USMC

Above: Part of the standard training for Lewis gunners was the blindfolded disassembly and assembly of the weapon.

Imperial War Museum

Left: Portuguese troops train with Lewis gun, 1930.

Following page, top: Marine trainees learn the Lewis gun from competent instructors who had already been through courses at the Savage Arms Company facility. Note the "Light Folding Field Mount" as built by Savage.

Following page, bottom: Lewis gun practice at Camp Custer, Michigan as National Guard troops train in 1919.

USMC

Michigan National Guard

Shadow shooting came next, and was perhaps the most pleasing in the entire course. The shadow of a ship, flying 200 feet or so above the one in which the gunner was riding was thrown on the water and served as a target. The bullet splashes would indicate the success of the student gunner.

A target towed behind another ship was the next object of marksmanship. Great care had to be exercised in this stage to cease firing when the pilot was turning, as the tail surfaces would often come between the gun and the target.

The last stage consisted of actual combat training, not with a real Lewis gun, but with a camera gun. A scout ship would attack a student's aircraft and the picture taken each time the student gunner pulled his trigger told what would have been the fate in regular combat. The entire course at San Leon required five weeks.

In terms of the Lewis gun's basic functioning, both air and ground training were much the same. The two week training program outlined by the U.S. War Department consisted of detailed explanations of the weapon and its use. After tactical theory, the students spent several hours learning the nomenclature of the parts and their inter-relationships and functions. By the second day the cadets were given their first blindfold assemble/disassemble test.

At the end of the week, the cadets could strip and assemble the weapon blindfolded, and they had good knowledge of field repairs for the weapon. After competitive exams, they began target training.

Live firing began after additional schooling in target selection and aiming. The rest of the week was spent learning all about the Lewis gun as a "live" shooting weapon. A great deal of time was spent on stoppages, malfunctions and misfires. According to the lesson plan, almost two entire training days were devoted to immediate action for the Lewis gun.

By the second Thursday, the Lewis gunner cadets were learning squad tactics and practicing night operations. Each gunner then went through a combat course featuring hidden targets operated as a primitive version of the Army's TRAINFIRE technique of the early 1960's. By the ending Saturday of the course, a new group of Lewis gunners was ready to go to war. For many Lewis gunners, the training phase came to an end all too quickly as they moved to a new phase where the target began to shoot back.

British tank gunners practice with Lewis guns ... 1917.

Imperial War Museum

Palestine Police receive training with the Lewis gun from British instructors in 1940.

SOLDIER Magazine

Royal Flying Corps class on the workings of the Lewis gun.

USAF

Imperial War Museum

Navy trainees learn the Lewis gun as WWII goes poorly for the free world.

Lewis Machine guns used in the World War I period by Marines.

Defense Dept. (Marine Corps)

U.S. fliers of the 96th Aero Squardon train with twin Lewis guns in France, September of 1918.

British Official Photo

National Archives

DIAGRAM A PLANE CROSSING GUN'S POSITION

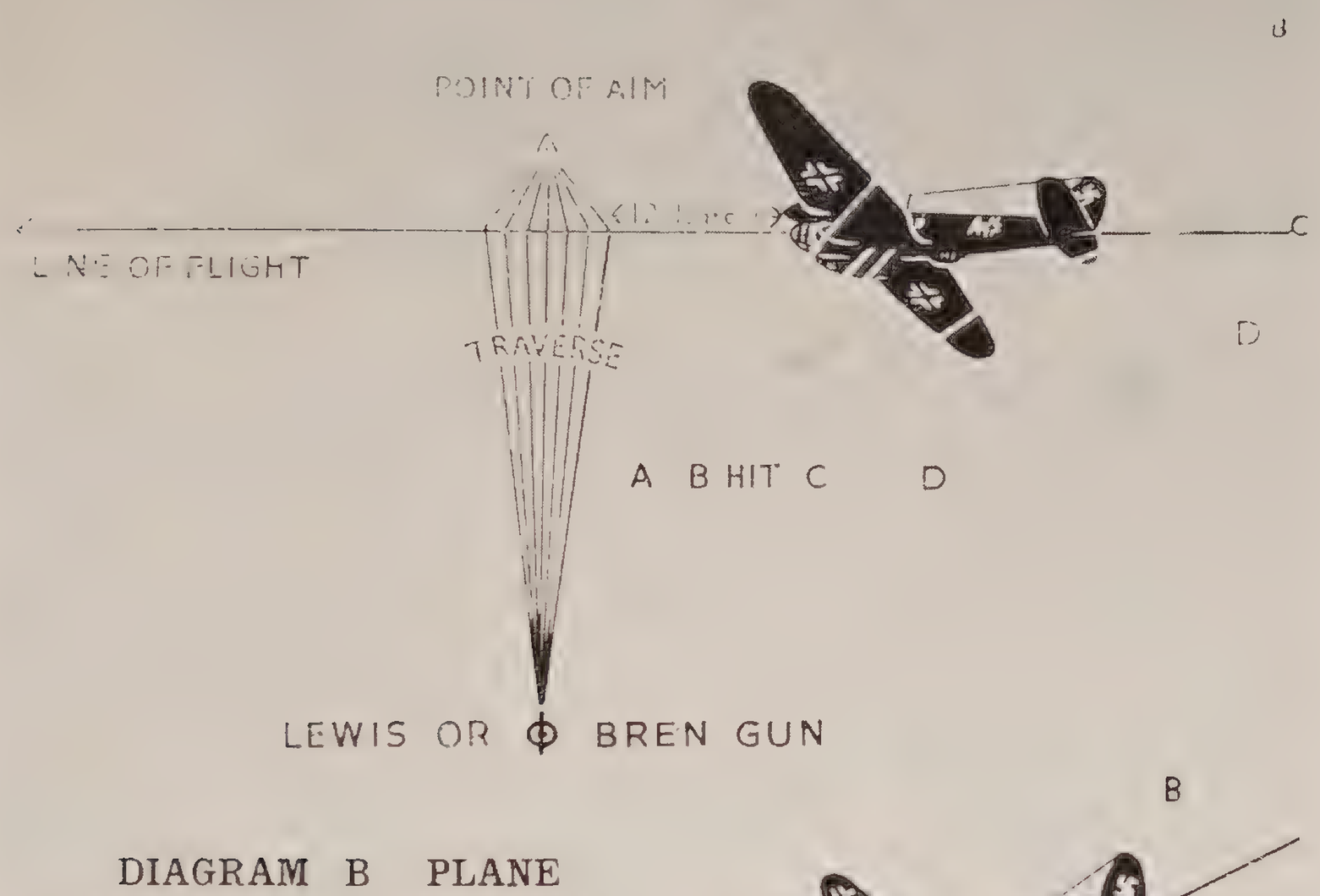
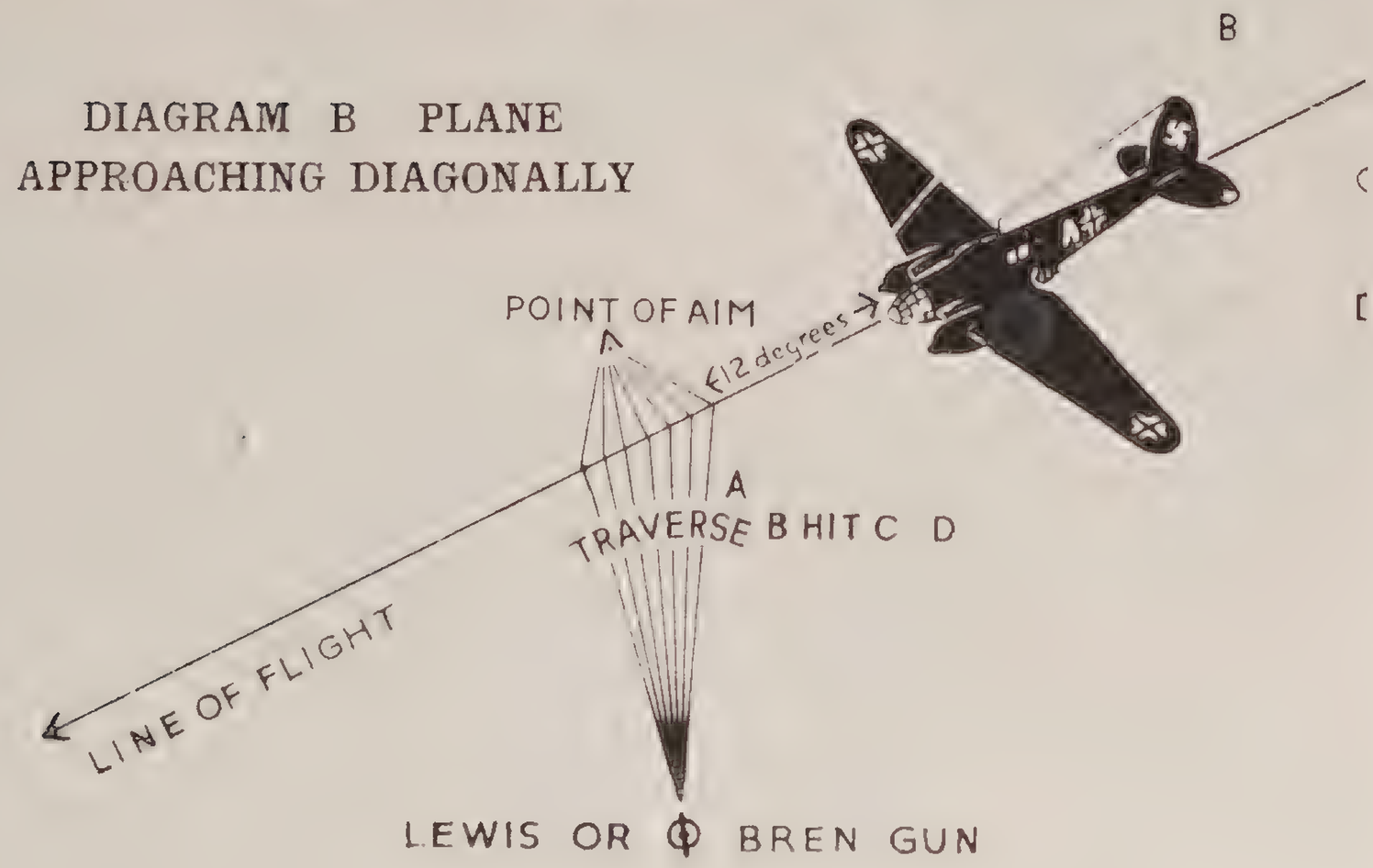


DIAGRAM B PLANE APPROACHING DIAGONALLY



Training diagram for British anti-aircraft gunners in the early '40s.

New Zealand Ministry of Defense

Government of Holland

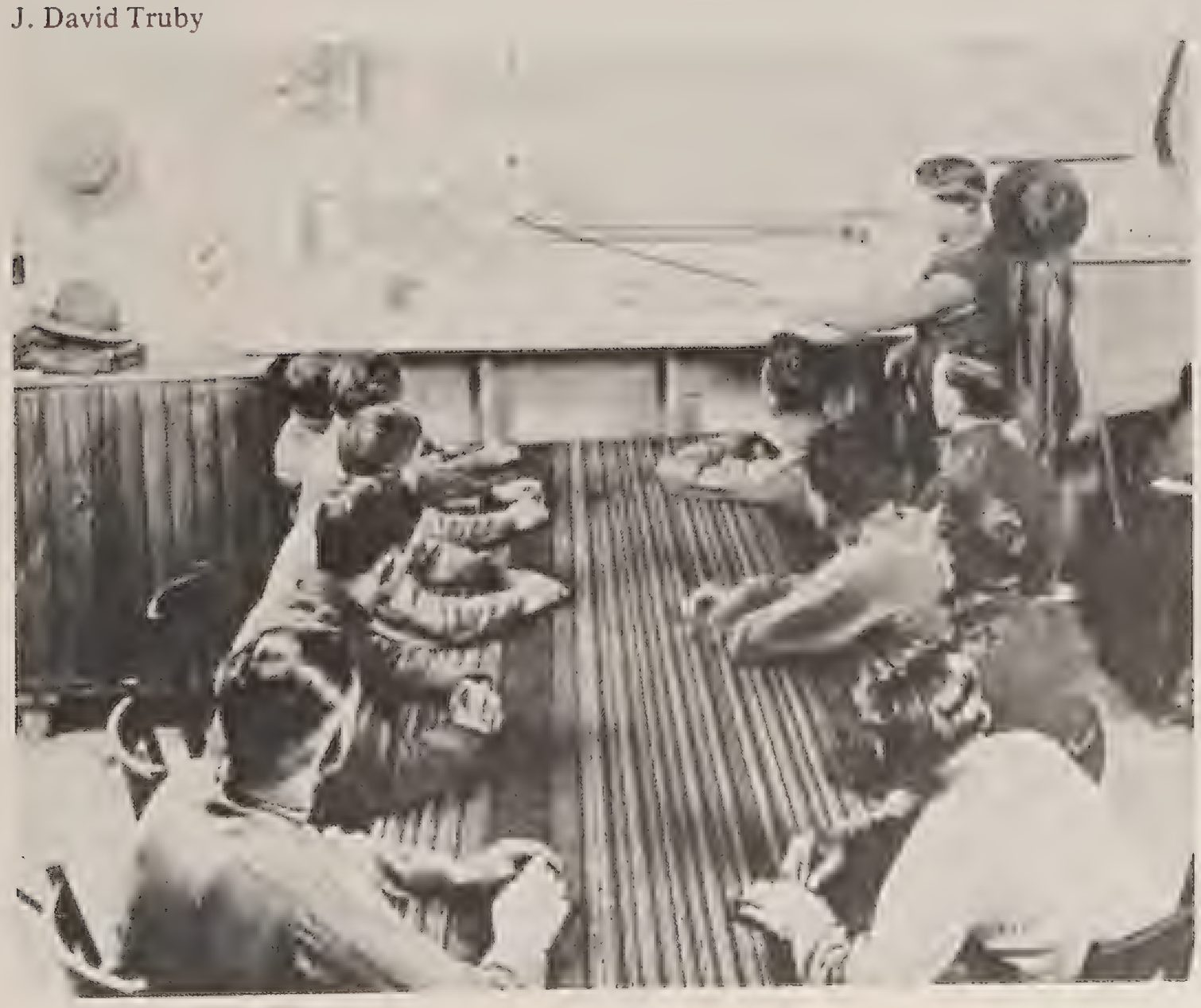
American flying officers learn sighting the Lewis during training for aerial gunners.

National Archives

Preceding page, top: New Zealanders learn the Lewis gun at British machine gun school just behind the lines.

Preceding page, bottom: Dutch troops training with their Lewis gun, modified and manufactured at the governmental arsenal.

J. David Truby



A Marine Corps class learning the theories of the Lewis gun.

Training cartoon issued to the Hong Kong Volunteer Defense Corps in 1938 showed problems of a chubby chap firing the Corps standard light machine gun—the Lewis. The Corps demanded strict fitness.

Dolf Goldsmith

USMC

A Marine Sergeant of Corregidor explains to a group of Filipino soldiers in March of 1942.

J. David Truby

British Navy gunners training for the Fleet Air Wing learned all about the Lewis gun ... many of these gunners ended up in Fairey Swordfish.

Konrad F. Schreier, Jr.

British Royal Engineers use sound equipment to "spot" enemy aircraft for Lewis gunners during 1937 training.

Below: Marines on the machine gun firing range, Quantico, Va. Marines in the foreground prepare to fire the Lewis gun, while a third gunner fires the Benet-Mercie.

USMC

J. David Truby

Left: Students learning the Lewis had to put it together blindfolded.

Australian War Memorial

Right: The 28th Australian Battalion trains with the Lewis gun at Renescure, France, in September 1917.

Below: Yankee observer/gunners were taught a great deal about using the Lewis gun after they reached Europe. Lt. Hunter's group learned how to properly sight their Lewis guns.

Brig. Gen. John H. Hunter

Israel Defense Forces Archives

Jewish Settlement Police train with the Lewis gun during Spring of 1942.

Canadian troops underwent instruction in the use of the Lewis gun as late as December of 1942.

Public Archives of Canada

Left: Jewish Settlement Police train youngsters in the use of the .303 Lewis gun in 1940.

Israel Defense Archives

Below: Marine officers, potential ordnance instructors, had very detailed training in the Lewis gun.

USMC

USMC

Above: Marines of the 81st Company Machine Gun Battalion, train on the Lewis Machine Gun with its tripod set in a hillside.

National Archives

Right: French Navy gunnery students firing Lewis guns after the War ... 1919.

7 • The Lewis In War

Below: Men of the 11th Inniskilling Fusiliers, supported by their Lewis gunners, advance near Havringcourt in November of 1917.

Imperial War Museum

Imperial War Museum

The Lewis gun was a favorite of the British soldier from the start. Its twenty-six pounds was far easier to move around in the confined areas and narrow passageways of the below-ground areas than the sixty-eight pound Vickers. When above the ground, the Lewis occupied a frontage of about three feet, and a depth from front to rear of about nine feet. With the bipod, its height was about a foot above the ground, and when concealed in grass or a fold in the ground, the gun was hidden at 300 or 400 yards. The firepower of the Lewis was equal to fifty riflemen who would occupy frontage of more than 100 yards, and was thus deemed, "a very efficient tactical weapon," by all who came in contact with it.

The Lewis was used in stalking and ambush work where automatic fire was needed, and by the end of 1916, following examination of many field reports, the British General Staff concluded the Lewis gun was the "...finest weapon for frontline trench strafing, both offensively and defensively."

Official reports also noted that the role of the Lewis was to assist infantry in clearing out enemy snipers, traps, observation posts, and tough pockets of resistance.

The standard infantry tactic of the day was an assault on a position. Accompanied by bombing parties, the troops were armed with grenades and light automatic weapons, and carried a minimum of equipment. The British troops would advance into No Man's Land and lie as close to the barrage as they dare. At the very moment the artillery barrage lifted, they would rush the enemy trench and keep the defenders busy until the more heavily armed body of infantry arrived to complete the capture. It was a tactic for which the Lewis gun was well suited.

By 1917, each platoon had at least one trained Lewis gunner. Emphasis was placed on movement covered by fire, or the French method of advancing by short rushes covered by light machine gun fire. Using this method, the Lewis was a tremendous weapon. Its mobility allowed it to continue into the attack along with the infantry it supported.

In addition to being mounted on Canadian motorcycles, Lewis guns were also mounted on, or in, tanks. The British Mark IV went into combat on 7 August 1917 with five .303 Model 1914 Lewis guns, which were fired through various ports in the body of the mammoth 30.2 ton tank.

The Lewis was standard secondary armament for Male Heavy Tanks Mark II, III and IV, and was the primary armament for Female tanks of the same models. Each tank carried from three to five Lewis guns, with one or two spares. The Lewis gun was standard for the new Mark IV Heavy Tank, which came into service in April 1917.

The armored covering in tanks needed to protect the water-jacket of the Vickers machine gun produced out-of-balance mounting, and made it very tiring to fire accurately. As there were production difficulties obtaining Hotchkiss machine guns, the Small Arms School at Hythe recommended the Lewis gun

Preceding page: Supported by a Lewis gunner, men of the 2nd Australian Division go into action near Armentieres on 18 May 1916.

Below: A mammoth British tank as it must have looked to German troops as it crushed their trenches during the Battle of Cambrai in October of 1917. Note two Lewis guns on left.

Following page, top: Canadian troops ride to war on a Lewis-armed MK IV female tank, France, 1917.

Following page, bottom: Mk I Make tank near Thiepval in September of 1916. Lewis guns are out of tank, being cleaned. The barrels are laying on the ground near the rear of the tank.

Imperial War Museum

RAC Tank Museum

Imperial War Museum

RAC Tank Museum

RAC Tank Museum

Imperial War Museum

Above: In the trenches with dastardly duty ... cleaning the Lewis amid the muck of Flanders. Note the gas alarm siren to the left of the Lewis gunner.

Preceding page, top: An Mk IV Male tank stuck during the Battle of Cambrai. Note one Lewis gun.

Preceding page, bottom: An Mk IV Female of the F Battalion Tank Corps crosses the wire in France. Note Lewis gun armament.

as the next best alternative; thus, the Lewis came to be used in tanks.

An early experiment took place with the British Third Army during the Battle of Amiens. Some of the Mark V tanks were lengthened several feet to allow room to carry a dozen or so Lewis gunners and spare magazines. The theory was that the tank carrying the gunners would lumber to its objective, unload the passengers, who would then occupy and defend the newly won position.

However, according to most tank veterans, the atmosphere inside the tank was a composition of about 75 percent exhaust fumes, 13 percent cordite fumes, 10 percent perspiration odor, and 2 percent oxygen. by the time the tanks were three minutes into the mission, half the Lewis gunners were alrady returning their breakfasts inside the tank, while the others were on the verge of passing out. It took only ten minutes to reach the objective, but by that time not one member of the squad of gunners was capable of lifting his weapon.

The same idea was tried again a few months later. Mark V Stars of the 1st Tank Battalion (Canadian), carried twenty men into battle, along with machine gun detachments with two Lewis guns and one Vickers.

In 1918, Australian troops, referred to as "Exploitation Brigades," utilized Mark V tanks to cover their advance as an assault troop armed with Lewis guns. While it became common in World War II for infantry to advance behind tanks, the Australians had detachments of Lewis gunners advancing behind tanks in an assault situation a war earlier.

But the use of the Lewis gun in a tank was less than ideal. One tanker's report after a tank engagement with German machine gunners in 1918 included the comment, "Every Lewis gun in the section had its barrel (cooling jacket) peppered with bullet holes. Unarmored, the Lewis was useless when it was hit."

According to the RAC Tank Museum, the Lewis was fitted with an armored sleeve, but was quickly discarded for the same reason as the Vickers's armored jacket. By the last year of the war, the British had switched to the light Hotchkiss gun.

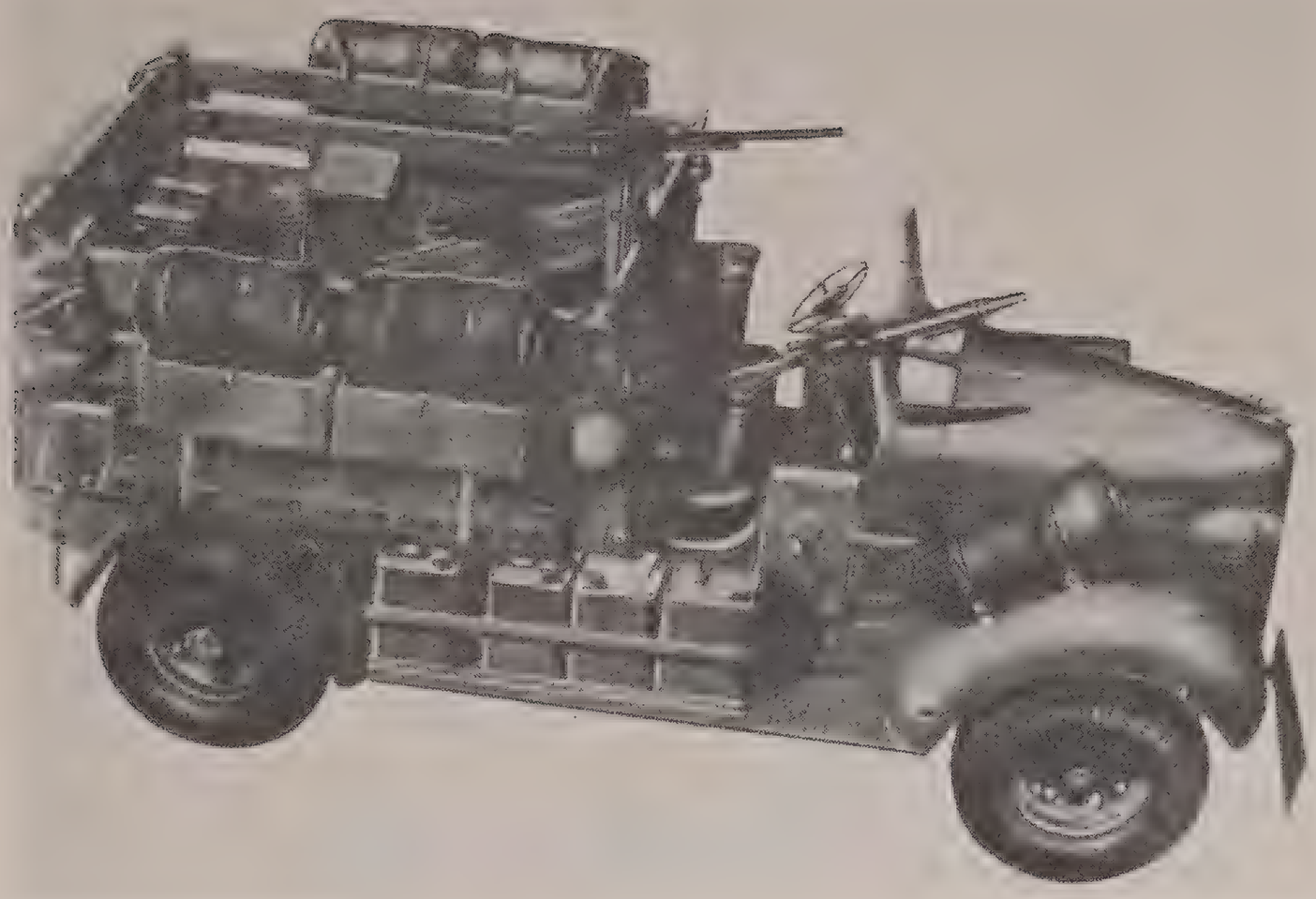
J. David Truby

U.S. Marine recruiting poster shows assault with Lewis gun ... hypoing Marine role in WWI.

Leading the action at the St. Eloi Craters, Lewis gunners of the Northumberland

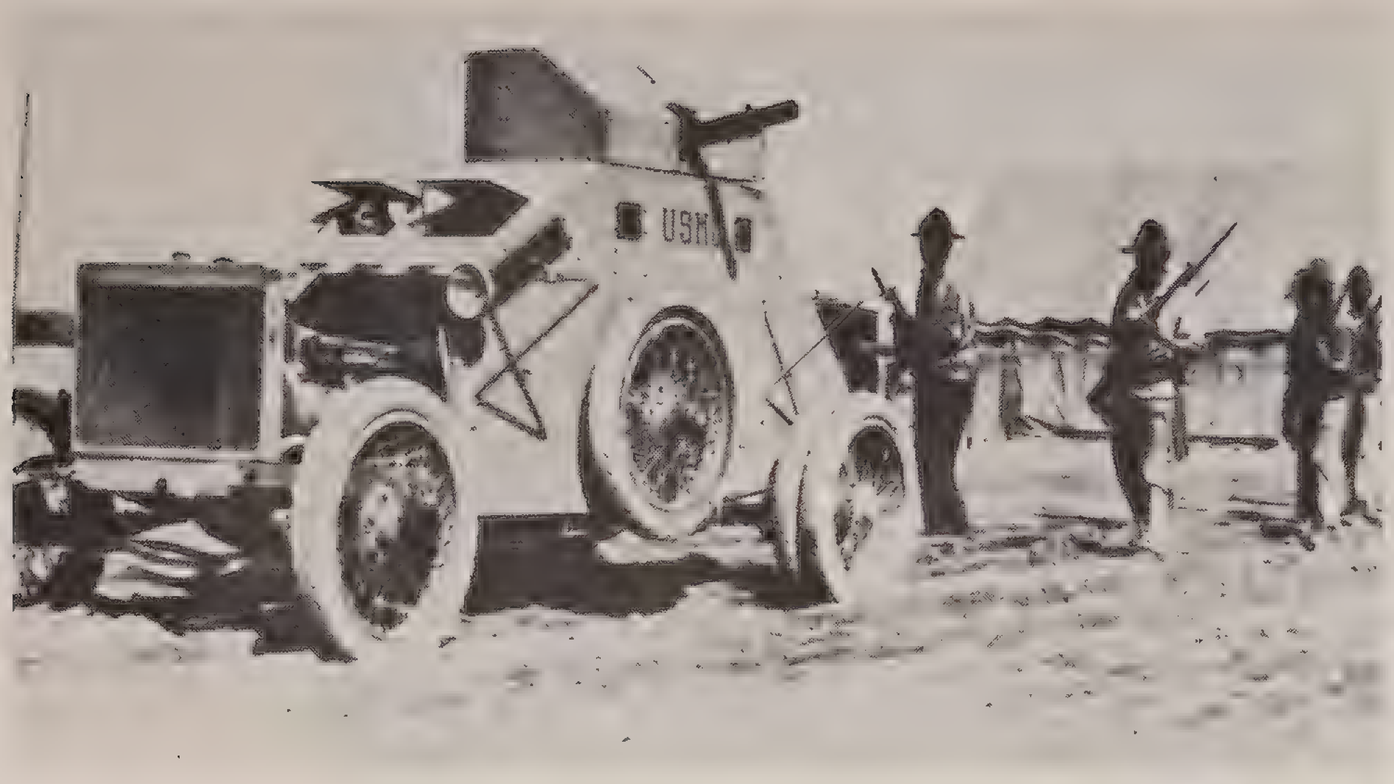
Imperial War Museum

Fusiliers show off captured German booty on 27 March 1916.



Chevrolet 30 cwt. truck was a basic transportation item for the LRDG—note Lewis gun.

Arthur Swinson



Marines follow King armored car, with its Lewis gun, in Haiti.

Gny/Sgt. Allen Smith

Mobile anti-aircraft mounting, Lewis gun on Cygnet type mounting and trailer.

Charles Yust

Following page: Belgian staff car with mounted Lewis gun.

Government of Belgium

"The need for machine guns has increased enormously ..."

Marines on the move behind a Lewis-armed King Armored Car, during the fighting in Haiti during one of the Corps common displays of Big Stick Diplomacy during the '20s.

USMC

Newly trained Lewis gunners parade as part of the Mobile Artillery of the Corps. The 1917 model Lewis gun is in the 1918 model cart, during this parade at Quantico, Va., near the end of the War in 1918.

USMC

B. S. A. , Ltd.

British Motorcycle sidecar fitted with Lewis gun.

The LRDG cut its own roads across Egypt in the Apring of 1941, using Lewis-armed trucks.

New Zealand Ministry of Defense

National Archives

Lewis gun on wheeled cart.

Loading a Lewis gun on a British cycle.

B. S. A.

Lowell Thomas

Col. T. E. Lawrence

Imperial War Museum

Gen. Edmund Allenby

Below: The old Lewis gun crosses the Channel with the old warrior—British Prime Minister Winston Churchill, as British officers head for France on 12 June 1944.

Following page: Although Marines were sent to Europe armed with Lewis guns, political influence was strong enough to force the military to take the Lewis guns away from the Corps 's gunners.

Imperial War Museum

USMC

Yet, as late as 1935, the French were still experimenting with the Lewis gun in their Renault Model 1935 light tank, a vehicle which normally used a Hotchkiss or Chatellerault machine gun. In 1918, the first U.S. light tank was testd with the Lewis gun.

In other mechanized uses, the Lewis was found in British and Belgian armored cars, and as an armament for motorcycle units. The Lewis was mounted for use by the sidecar passenger. The British added light armor to their sidecar, and included an armor shield in front of the driver; using their Lewis-armed motorcycles as attack vehicles in several cases.

The motorcycle was to play a large part in the mobility of the European war; ideal for message delivery, quick transportation, or for mobile placement. This last idea won the hearty approval of Isaac Lewis, as B.S.A. turned out motorcycles whose riders were armed with Lewis guns. The idea was not to provide a mobile firing platform, but to provide a vehicle to get the gunner and his weapon in place as quickly as possible. The B.S.A. motorcycle mounted Lewis guns saw much action in Europe.

The type of warfare being waged by the British in the Eastern campaigns was ideal for the use of a light automatic weapon such as the Lewis. For example, Maj. Gen. Edmund Allenby made tactical use of the Lewis gun in capturing Jerusalem, and was praised by Winston Churchill.

Allenby also put his Lewis guns to use one week before the opening of the Battle for the Hindenburg Line, when he broke the Turks in the Eastern theater.

Then, there was Thomas Edward Lawrence, a man who loved the Lewis gun. Calling the Turkish army a "...gross accident," Lawrence of Arabia helped Allenby win the conflict in the Middle East. Striking in a hard, fast, guerilla style, T.E. Lawrence set the stage for the type of fighting waged by the British Long-Range Desert Strike Force Group a war later. Lewis guns were his favored weapon, as is mentioned time and again in his classic book, *Seven Pillars of Wisdom.*

The Lewis gun has been documented as a successful weapon, which means it created enemy casualties in an effective, efficient manner. According to British figures, the last major Allied drive in France, prior to Christmas of 1917, involved approximately 70,000 Lewis guns. One estimate had it these weapons accounted for at least 80 percent of the German casualties.

On 20 December 1915, speaking in the House of Commons, David Lloyd George thundered, "The need for machine guns has increased enormously. The casualties caused by this weapon are probably 92 percent of all casualties."

According to official munitions reports, since the first shot was fired in 1914 until the last shot in 1918, the British fired between five billion and eight billion rounds from their .303 Lewis guns—and that was only on the ground.

Public Archives of Canada

WAR Magazine

USCG

Above: British Motor Torpedo Boats were armed with quad-mounted Lewis guns.

Left: Coast Guard cutter dumps depth charges on German sub near New Jersey coast, 1942. Note Lewis gun.

Preceding page: Canadian officer fires tracers in an armor-mounted Lewis gun during Navy gunnery practive in 1943.

A Lewis anti-aircraft unit hidden in a field near Lavieville in August of 1916. Note the rangefinder behind the men.

Imperial War Museum

Practicing against Boche aircraft can be done with a small mounting sunk into a post, as these gunners show.

USAF

Australian War Memorial

A group of Lewis gunners of the 5th Australian Division advance near Longueval, France, in January of 1917.

Lewis gun used as mounted ranging gun on a Davis recoilless gun.

USN

"A good landing is any one you can walk away from" is what veteran pilots told the newly arrived U.S. trainees. A French Breguet after what Lt. Hunter called "A little jolt in landing."

Brig. Gen. John H. Hunter

National Archives

Heavily armed GA-1 triplane.

Pilot and observer in a Handley-Page bomber near Cressy, France, September 1918 ... Lewis on Scarff-ring mounting.

Imperial War Museum

Brig. Gen. John H. Hunter

A Caudron G-4 flying near the front, France, 1918, photographed from above by then Lt. John H. Hunter, an aerial observer.

Imperial War Museum

The 46th Division crossing the St. Quentin Canal on 29 September 1918. Note Lewis gun support.

Australian War Memorial

Government of Holland

Official Admiralty Photo

Left: Twin Lewis guns guarded Admiralty ships against air attacks during WWII.

Below: The 54th Australian Battalion established Lewis gun positions all around Peronne in September 1918 prior to their attack.

Preceding page, top: Machine gunners of the 40th Australian Battalion strip and clean their weapons in the Ypres Salient in October of 1917. Many Lewis gunner lost their lives during this fighting.

Preceding page, bottom: Dutch troops prepare to defend their homeland against the Nazis during the first days of the War ... preparations which included the old Lewis gun.

Australian War Memorial

Australian War Memorial

Lewis gunners of the 4th Australian Division also used captured German trench mortars during action in the Ypres Salient in September of 1917.

British officer and his section use a Lewis gun to hold a mountain trench.

Imperial War Museum

Imperial War Museum

The 12th Royal Irish Rifles used the Lewis as an anti-aircraft weapon, too. This shot was taken near Essigny on 7 Feb. 1918.

Camp life in Palestine in 1941 still featured the Lewis gun as a firstline British anti-aircraft machine gun.

SOLDIER Magazine

Australian War Memorial

Australian Lewis Gunners of the 1st Battalion set up near Ypres, Belgium, in November of 1917.

British armoured cars and aircraft policed much of the Middle East in the years between the wars, and even into WWII.

J. David Truby

Imperial War Museum

COLLIER'S

Preceding page, top: Lewis guns beef the defense line for the 2nd Battalion of Black Watch near Arsuf during the summer of 1918.

Preceding page, bottom: Lewis gun mounted on Lewis anti-aircraft bracket as used by British Colonial Troops, Middle East, 1918.

Frederick B. Daniel

Allen Buckley

Above: Lewis gun inspection aboard the USS TENNESSEE on China river patrol in the early 1920s.

Left: Contemporary sketch of the Morane scout, a Lewis-armed monoplane.

Imperial War Museum

Twin British Lewis guns mounted on a B. E. 12B.

National Archives

Lewis gun crew in the attack during 1918 manuevers.

The Merle Olmsted Collection

The Douglas 0-2H carried a Scarff-mounted Lewis gun during its service in the 1920s.

Gunners on the USS KROONLAND fire at a floating mine, 1918.

USN

8. The Lewis In The Air

Col. G. B. Jarrett

Aerial combat started out innocently enough: a German pilot flying a Taube got a little above his British counterpart in a Farman pusher, then dropped five building bricks down at the Englishman. Only one struck the flimsy Farman, and knocked a hole in the wing. On his next patrol, the angered English pilot carried his Webley service revolver with him and emptied it at the first German aircraft he saw. The startled German pilot stared in horror at the British officer.

The armed aircraft was most awesome in revolutionizing modern warfare. By adding the deadly power of light machine guns to the aerial mobility of frail scout aircraft, an efficient, modern fighting concept was developed.

France entered war with 136 aircraft of varying descriptions, while England had 153, of which only thirty-seven were operable. The Germans had 180 aircraft, all first line, flying-condition ships. When the great war officially got underway, all British aircraft were totally unarmed except for two of the Royal Navy Air Service ships which had been testing temporary Lewis gun mountings. By contrast, the German airmen carried the Mexican Mondragon semi-automatic rifle—a highly advanced weapon for the time—sold in some quantities to Germany by the licensed manufacturer in Switzerland. The Germans designated the weapon the "Aircraft Self-loading Carbine, Model 15."

It would be nearly three years until the British authorities officially "discovered" the value of attacking ground troops from the air. When their light finally did go on, the Sopwith Salamander became the forerunner of the modern attack plane. Known officially as the TF. 2, the ship was armored against ground fire and carried six machine guns: two fixed Vickers firing forward, two Lewis guns on a yoke mounted on the top plane, and two other Lewis guns mounted low in the cockpit firing through floor openings at a forty-five degree angle.

Early aerial machine gunnery could be simplified as being merely point-blank firing. Wind was not really a factor, as wind speed is

Hawker day bomber of WWI Fame ... Lewis gunner all set for the mission.

relative to the speed of the planes and the bullets. However, the factor of deflection, the allowance that must be made for the speed of the two aircraft, was important and the aerial guns of the early days had sights designed to compensate for this factor.

Most all Lewis guns modified for the flexible aircraft service used the Norman Wind Vane sight. This device automatically compensated for the aircraft's speed by the force of the slipstream applied to it. The only problem aerial gunners reported with this type sight was eddies of air currents which drifted around the gun firing directly aft.

Despite the scientific soundness of the special sights, most gunners did not regard them as the number one aid in hitting other aircraft. The gunners agreed their greatest marksmanship aid was the tracer bullet, usually loaded as every fifth round.

The Lewis was a flexible or free gun, generally mounted on a Scarff ring, named for the mount's British inventor, Warrant Officer Frederick W. Scarff. The Scarff ring was a metal track encircling the gunner's cockpit, to which a U-shaped tube was attached. The gun was mounted on the tube and could be freely traversed, elevated, depressed and locked into most any position. The ring soon became the standard mount for flexible guns on all allied aircraft.

Because of the restricted amount of weight early aircraft could carry, armament had to be as light as possible. Extra pounds meant more problems for the fliers, and they searched for ways to cut down on the bulk of the cargo. The average two seater carried about nine or ten spare Lewis drums, or somewhat less than twenty-six pounds of extra weight. The removal of the cooling jacket cut the weight of the gun to slightly under 17½ pounds, so that additional ammunition pans could be carried on the aircraft.

By 1916, most Lewis guns were mounted on the Scarff ring in the observer cockpit, usually singly or in pairs. The idea of pairing the guns was offset by the weight in-

On the Sopwith production line in Nov. of 1917, arming Sopwith Dolphins with two Vickers and two Lewis guns.

Sopwith Aviation

USAF

Twin Lewis guns, with shell bags, mounted on Scarff ring.

volved and the problem of swinging the double guns in a powerful slipstream. The idea behind the twin-mounted Lewis guns was to make gunners twice as destructive. Most observers, however, who were experienced machine gunners from the infantry, preferred to work with the single weapon and did so most effectively.

Aerial gunners using the Lewis had an advantage. While they worried only about firing a flexible gun at the other aircraft, the single-seater pilot had to divide himself between flying, observing, and gunning. Thus, while the dashing scout plane is the romantic hero of the pulps, the accurate gunner in the slower, sometimes ponderous looking two-seater often came out ahead in the actual battle.

Some of the stories involving the early Lewis mountings in Britan's less than sleek combat aircraft were not very glamorous. On some pusher aircraft, where the gunner sat ahead of the pilot, the Lewis was mounted on a movable socket-pillar device, so the gun and socket could be placed in any of the six prongs set on a semi-circular metal bracing ring. The Lewis had to be physically manhandled into the six mounting positions in the gunner's cockpit.

One of the more successful designs of Lewis-armed two seaters was the Vickers "Gun Bus" series. According to many experts, the Vickers FB-5 Gun Bus was the first purposefully designed combat fighter for the British. It was, according to the designers, literally built around the Lewis gun. The improved Gun Bus flew in combat until late in 1917. The observer in front was armed with a forward-firing Vickers and a Lewis gun mounted on a telescopic pipe mount which fired in all directions. Some models carried two Lewis guns.

Britain, France, and Belgium weren't the only users of aerial Lewis guns. Some of the weapons sold to Russia eventually found their way into the armament of the Ilya Murometz, a mammoth Russian four-engine bomber designed by Igor Sikorsky. The only World War I bomber to have a tail-gunner

position, this aircraft carried bombs of up to 1000 pounds. The massive ships flew over 400 missions, and only lost one to the German fighters. Their armament usually consisted of four to eight mounted Lewis guns. Russian fighters also mounted Lewis guns.

LTA's (Lighter-Than-Air aircraft) were also armed with the Lewis gun. Coastal airships of the Royal Navy were armed with from two to three Lewis guns, plus an assortment of Very pistols, bombs, and rifles. One Lewis was mounted on a Scarff ring located at the top of the airship, while the other gun or two had Scarff post mountings in the car.

Several designs of the French LTA's were armed with two or more Lewis guns, as were two types of Italian airships. These allied airships were generally observation and defense craft. The famous German Zeppelin night raiders were primarily offensive craft.

While gallons of printer's ink splashed praise on the plucky fliers and their Lewis guns, Germany was badly losing the war by the beginning of 1918.

Canadian Forces Photo

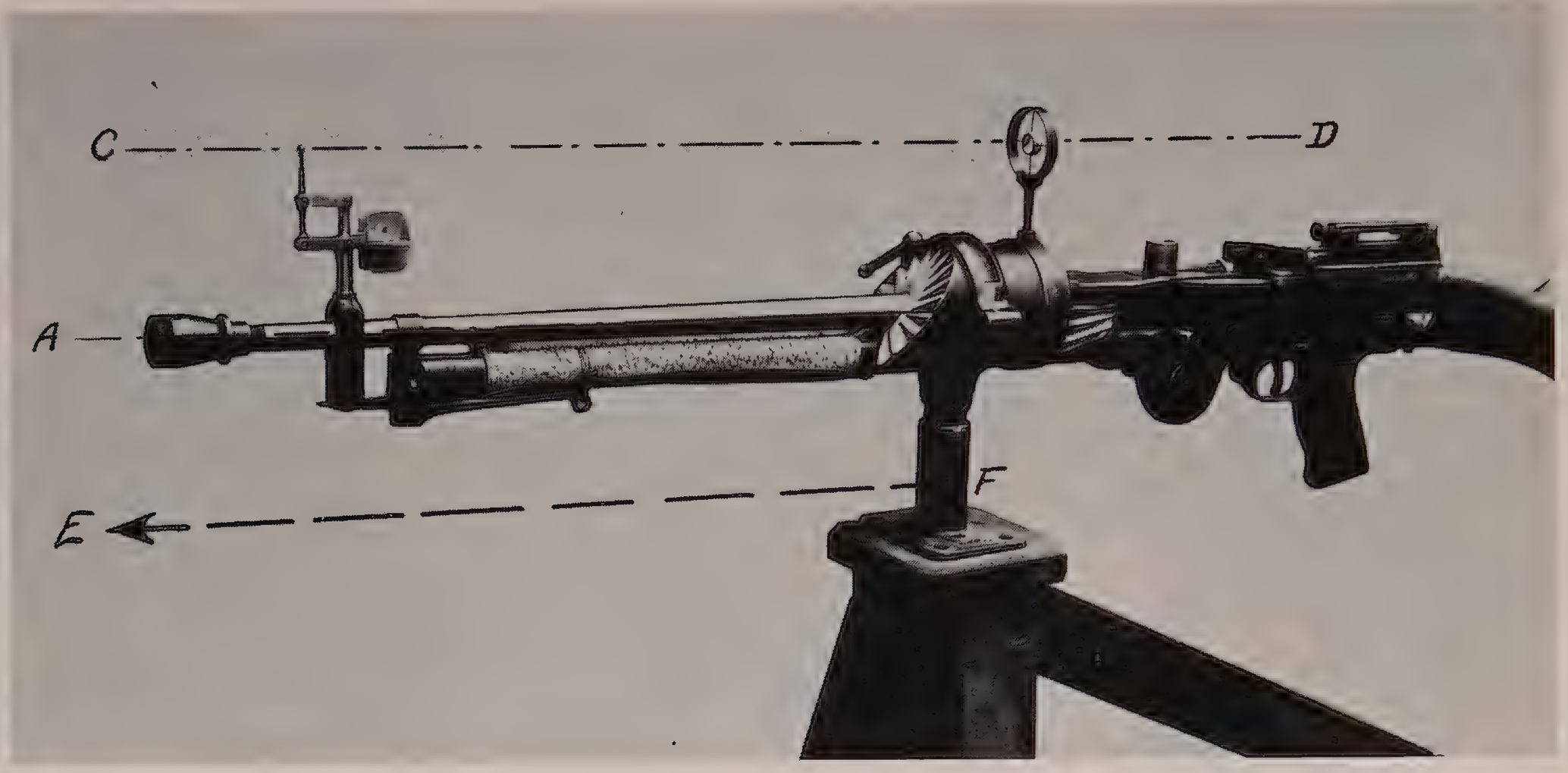
The bottom gunner of an experimental gun position on a Canadian bomber. The Lewis gun fired through a sliding panel in the bottom of an American-made DC-3 aircraft.

FE 9 prototype with front-mounted Lewis gun.

Imperial War Museum

Imperial War Museum

Hull of British airship—note Lewis gun armament.



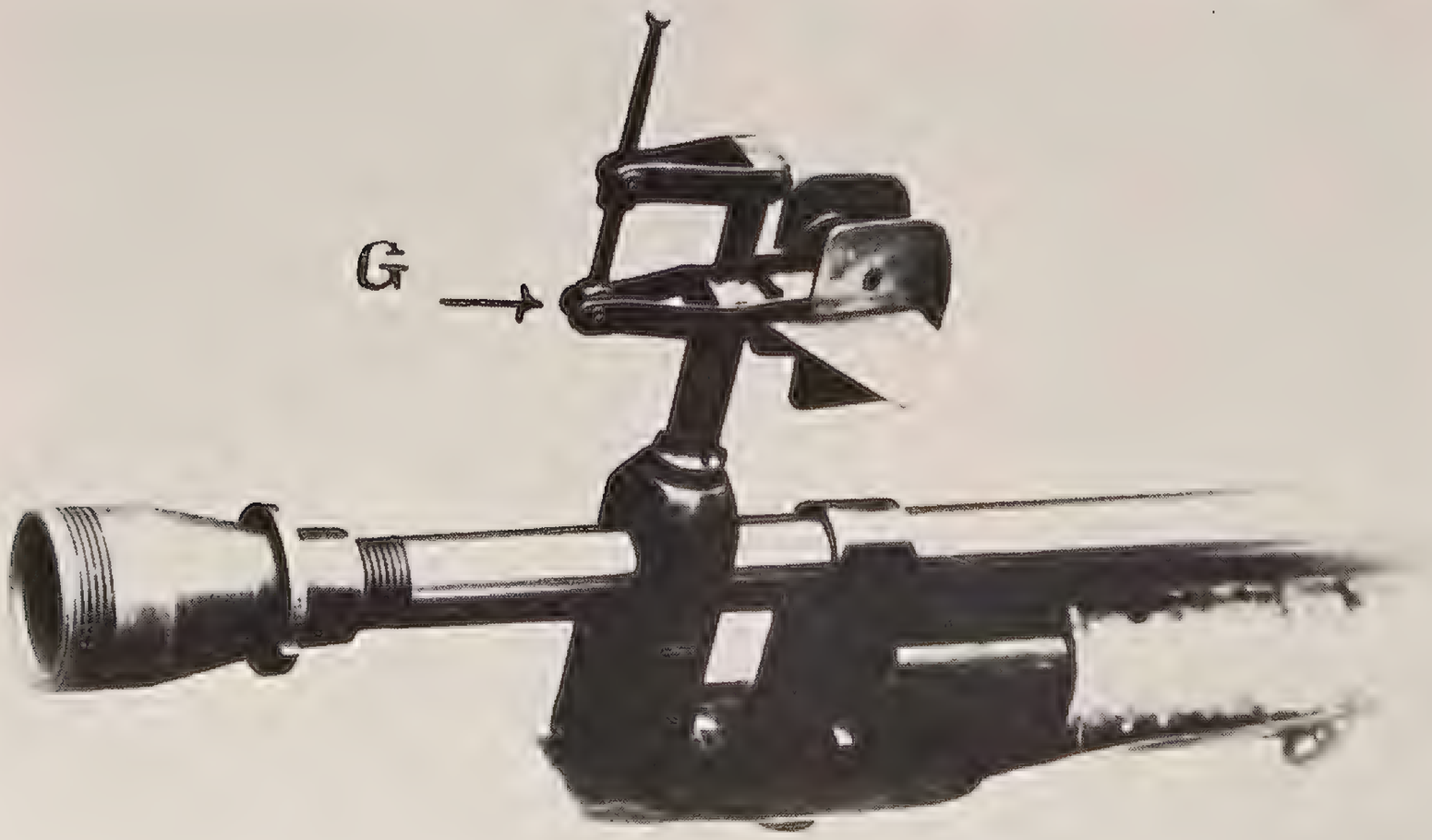
Above: Use of the Wind Vane sight.

Right: Lewis aircraft sight shown on stripped weapon

J. David Truby

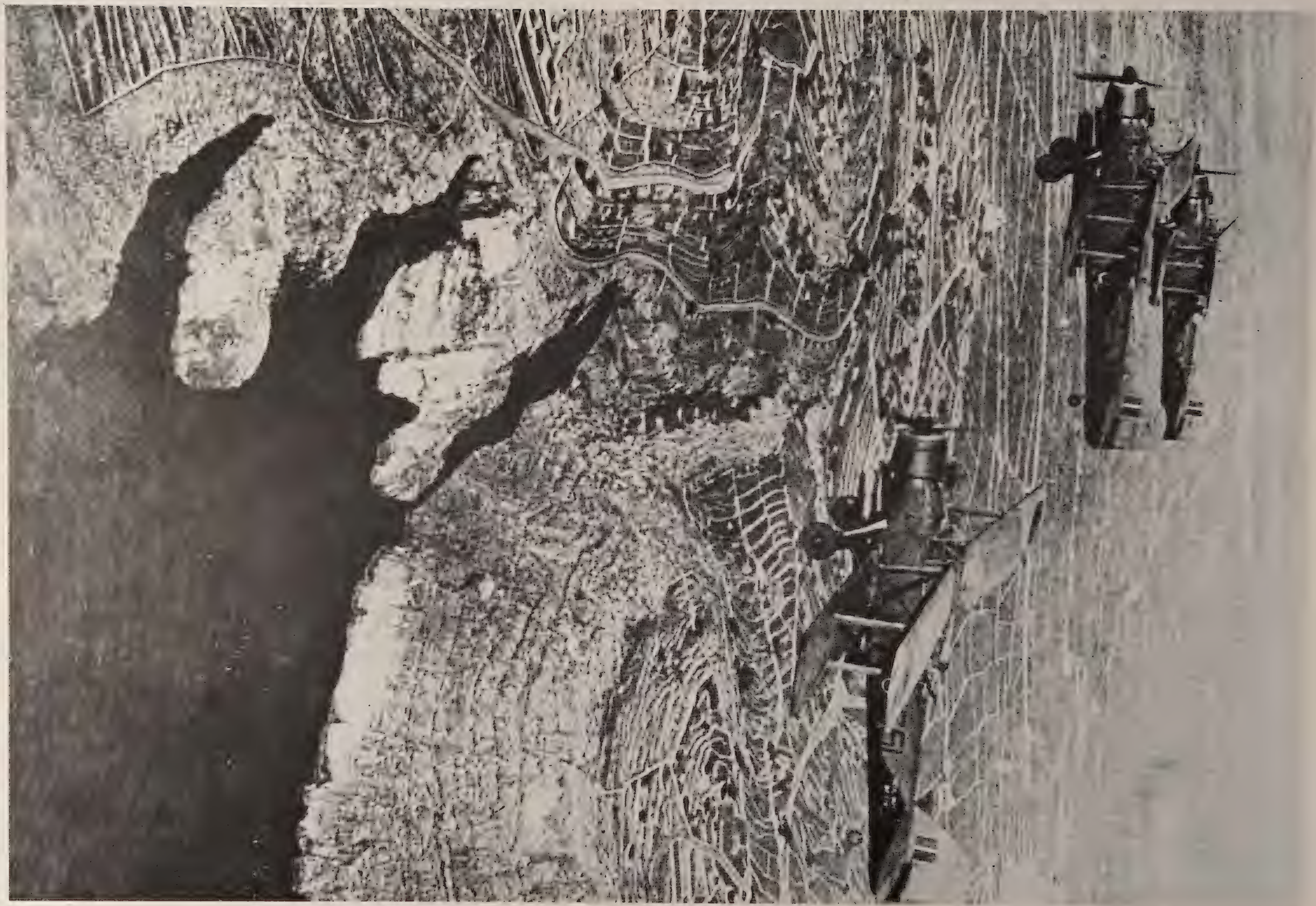
Following page: Royal Navy ALBATROSS patrol aircraft were armed with Lewis guns. This flight was based in Malta.

Below: The Norman Wind Vane sight on the end of a Lewis barrel.



Imperial War Museum

Caramar Photo



USAF

Lewis machine gun mounted on a "Baby Nieuport."

USAF

An observer checks his matched aerial Lewis guns prior to a mission beginning.

Imperial War Museum

SE5A Scouts of No. 85 Squadron at St. Omer, June 1918.

Above: Preparing for a gunnery training flight with the Curtis JN4A in Canada.

Canadian National Museum of Science & Technology

National Archives

Left: Twin-mounted ground model Lewis guns on a Curtis aircraft.

Charles Yust

Left: The Lewis gun was tested in power turrets for aircraft use as late as 1939.

Below: Cmdr. E. H. Dunning lands his Sopwith Pup on the H. M. S. FURIOUS after first successful landing, 2 Aug. 1917.

Imperial War Museum

Imperial War Museum

Imperial War Museum

Imperial War Museum

Imperial War Museum

Imperial War Museum

Col. G. B. Jarrett

Preceding page, top: DeHavilland DH4 with early Lewis gun.

Preceding page, center: Heavily Lewis-armed Sopwith Bulldog carried two Lewis and two Vickers machine guns.

Preceding page, bottom: Vickers F. B. 5a "Gun Bus" with ground model Lewis gun mounted on the modified nose section.

Above: Sopwith 1½ Strutter with Lewis gun.

Above, center: The Sopwith Dolphin was a heavy and well-armed Scout.

Left: Capt. Georges Guynemer, a true ace with 54 confirmed victories. Note the Vickers gun.

Imperial War Museum

Left: An FE2D of No. 20 Squadron at St. Marie Capelle, France, in 1917, armed with Lewis guns.

Below: A large 3-seat ground attack aircraft, the F. E. 4 carried up to 4 Lewis guns.

Following page, top: Flying officer Hanciau of the Belgian Air Force ... which used the top-mounted Lewis guns.

Following page, bottom: Gun mount invented by Louis A. Strange, allowed pilot to fire his Lewis gun at an outward angle.

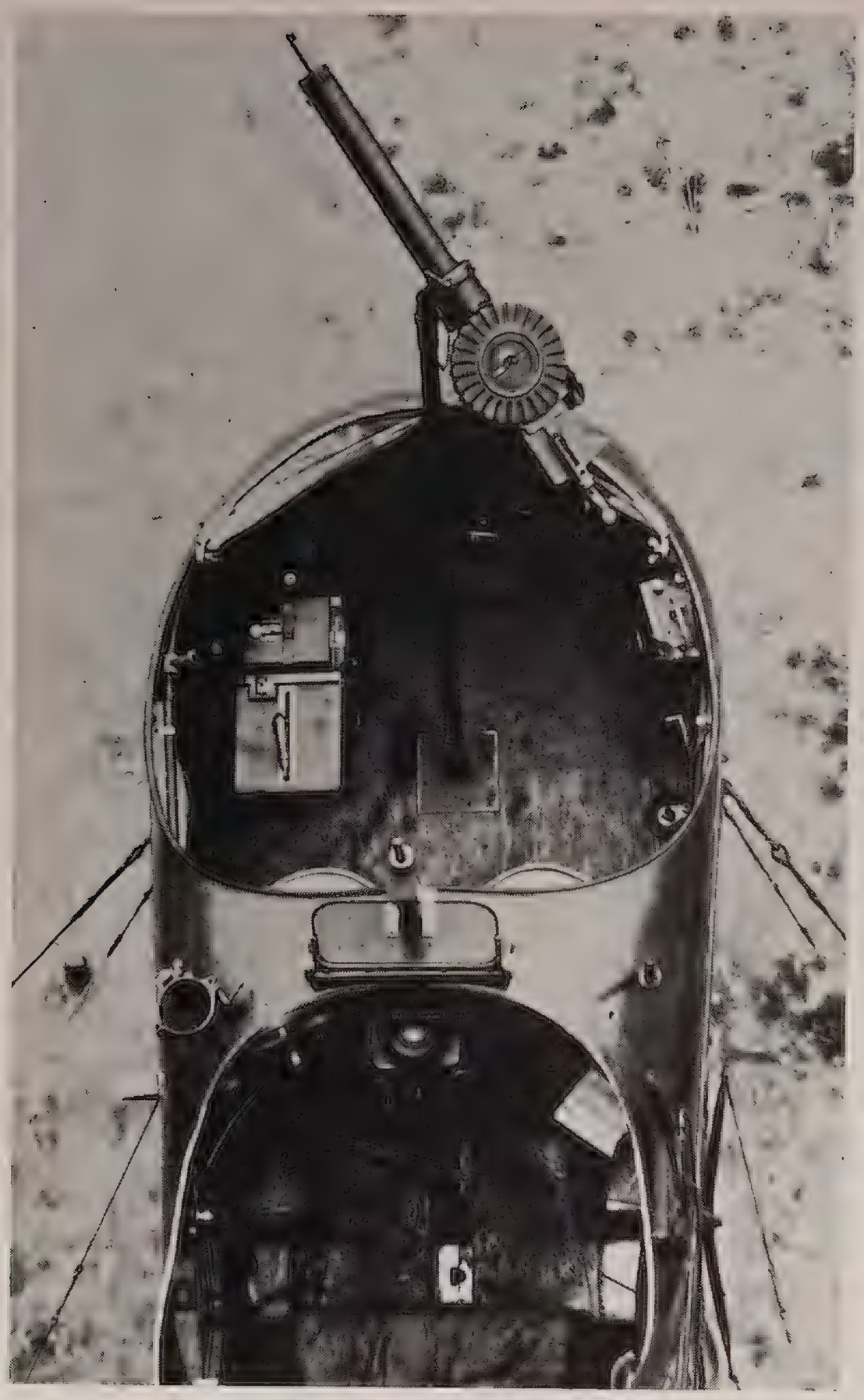
Imperial War Museum

Musee Royal De L ' Armee Et Histoire Militaire

Imperial War Museum

USN

Continuing aircraft trials, a British seaplane tender launches a Sopwith Camel in November of 1919. The Camel carries a Lewis on the top-plane.



Imperial War Museum

Left: Early Lewis gun mounting on a pipe in front cockpit of a Vicker's Gunbus.

Below: The Soviet II-4 bomber was armed with a turret-mounted Lewis gun through the early years of WWII. The weapons were produced by B. S. A. and Savage Arms Company, but carried Soviet proof marks.

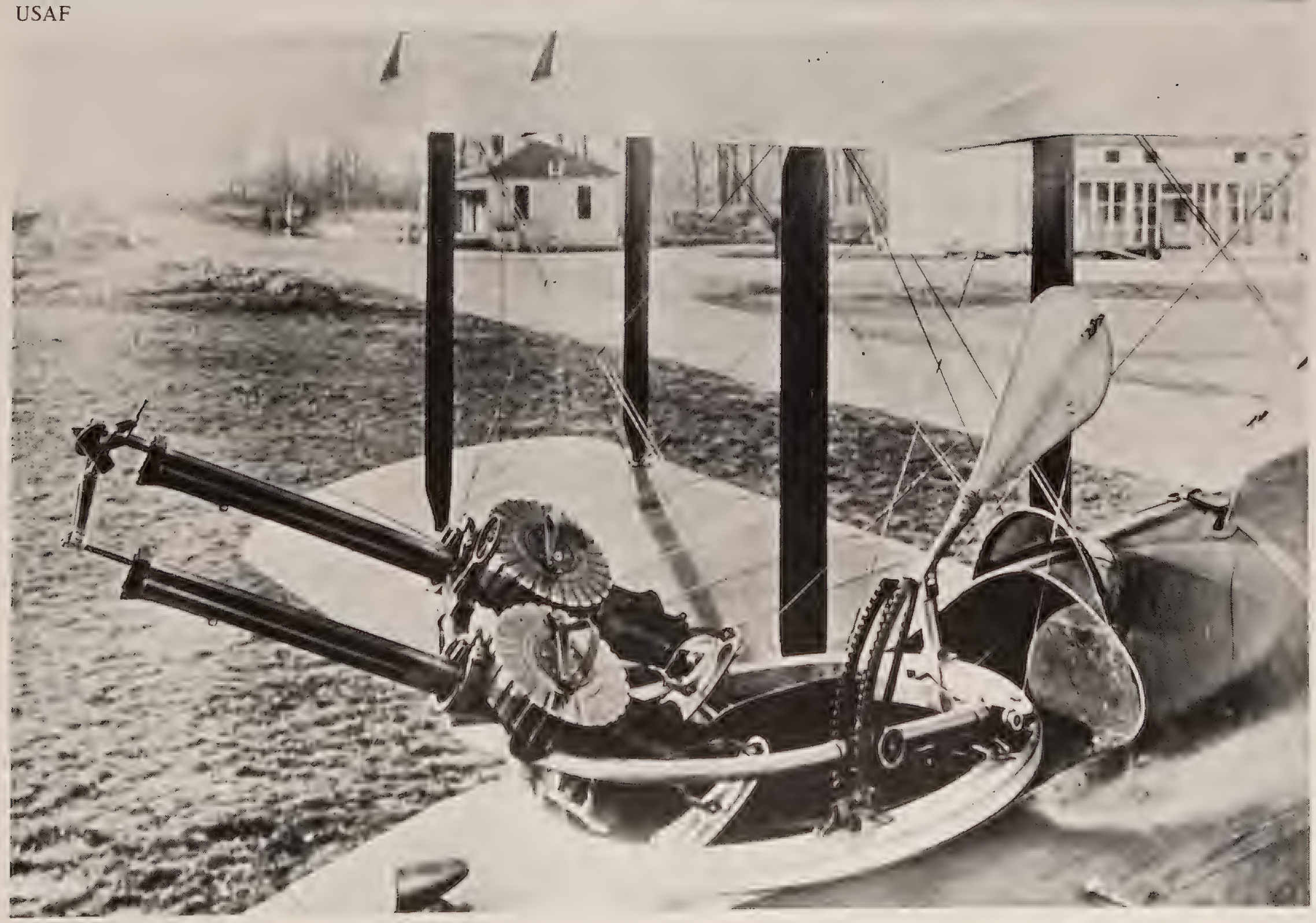
USAF

Right: A U.S. Navy flying boat shows Lewis gun posts in 1919.

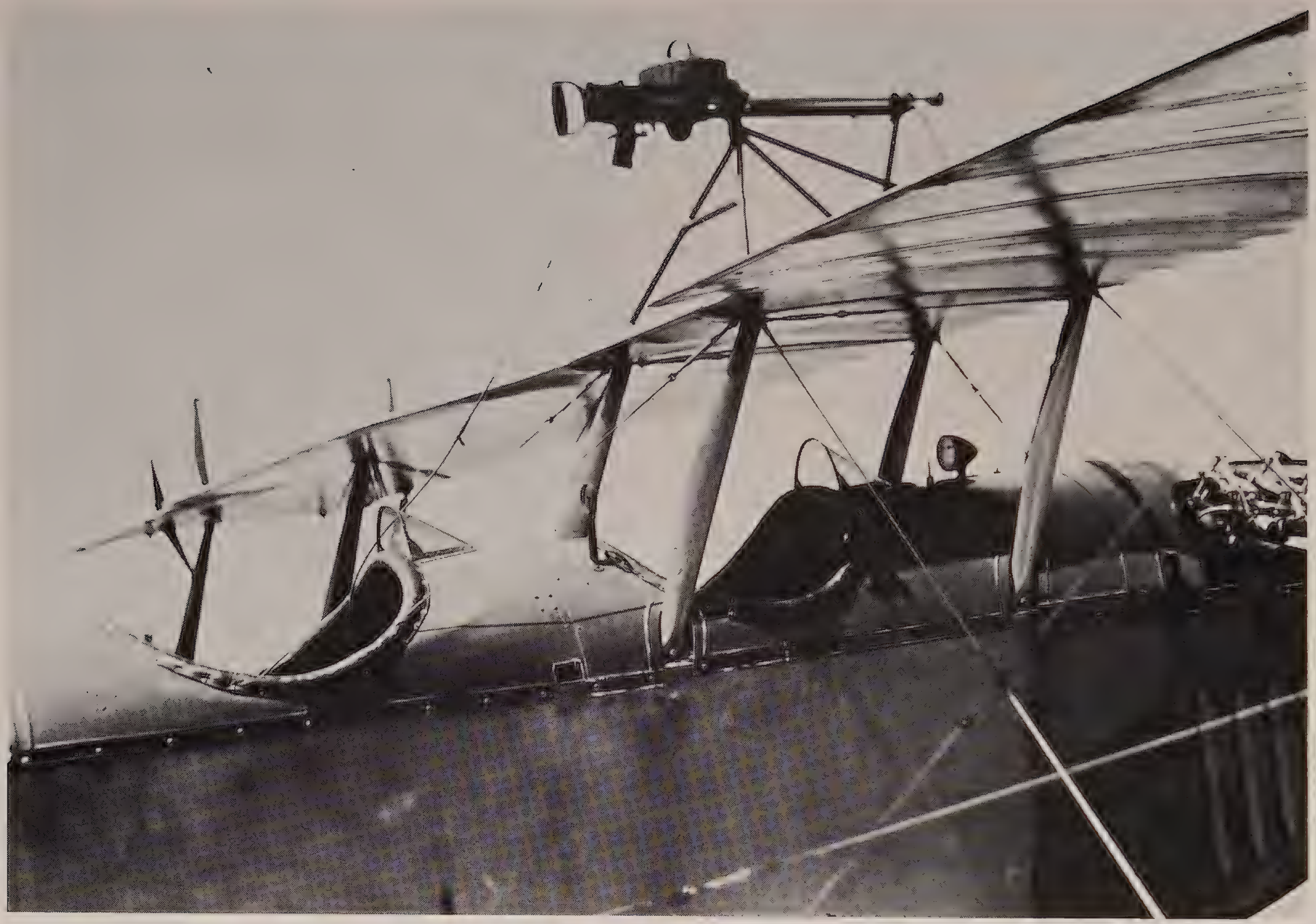
USN

Below: Twin Lewis guns with compensator and ring sight, also, new back rest for gunner.

USAF



USAF



USAF

Imperial War Museum

Preceding page, top: Top-mounted Lewis gun on U.S. aircraft, using Bowden cable to fire weapon.

Preceding bage, bottom: The Curtis A-3 "Falcon" was a Lewis-armed post-War fighter through the 1920s.

USAF

Above: A British J.2 A flying boat of the Royal Navy Flying Corps used a variety of Lewis guns.

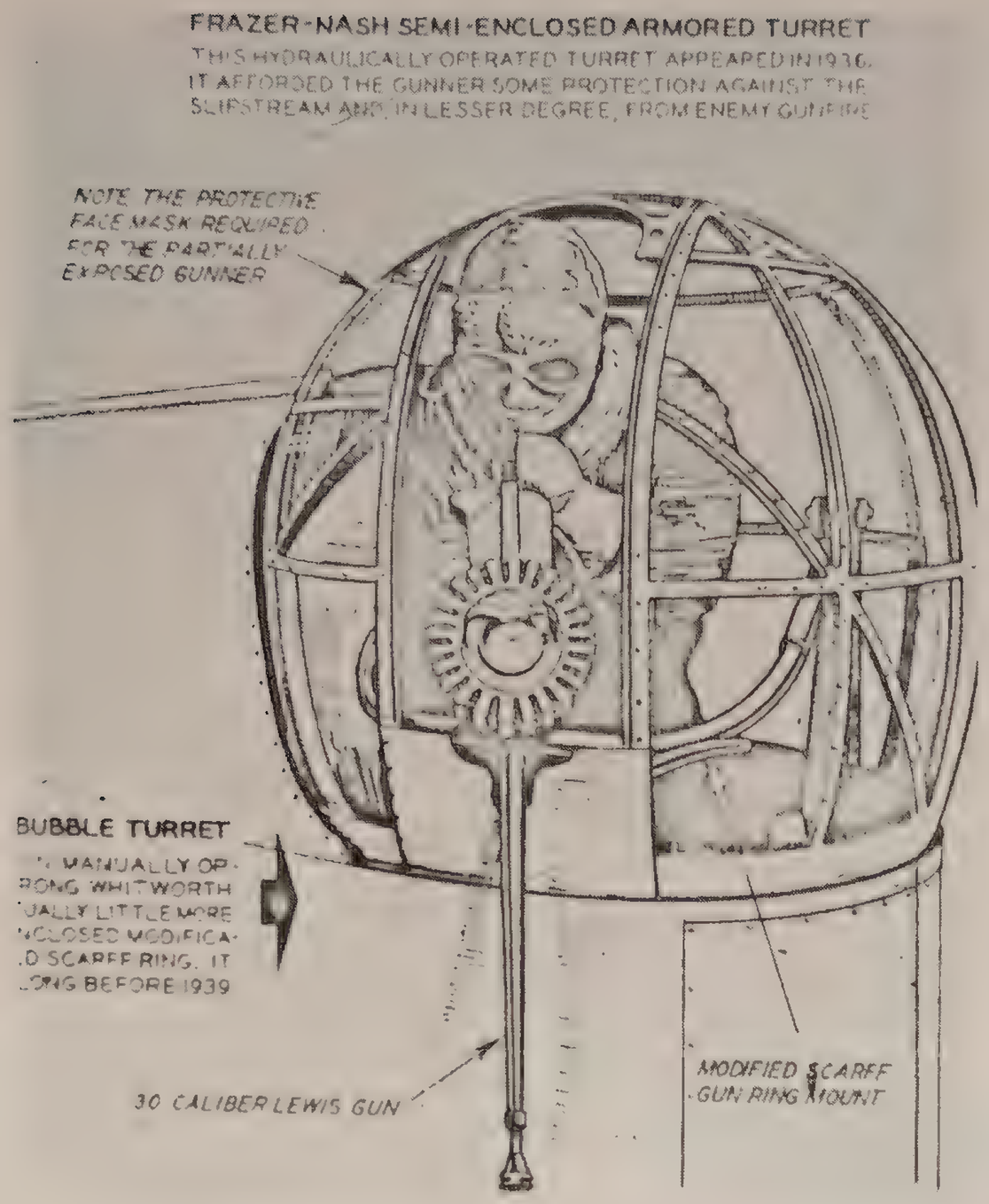
Below: A JN-4 with a Lewis gun on a vertical mount, and pilot's telescopic sun sight.

USAF

Above: An Air Force mechanic cleans the Lewis gun mounted on a Curtis JN-4 aircraft, on a vertical mount.

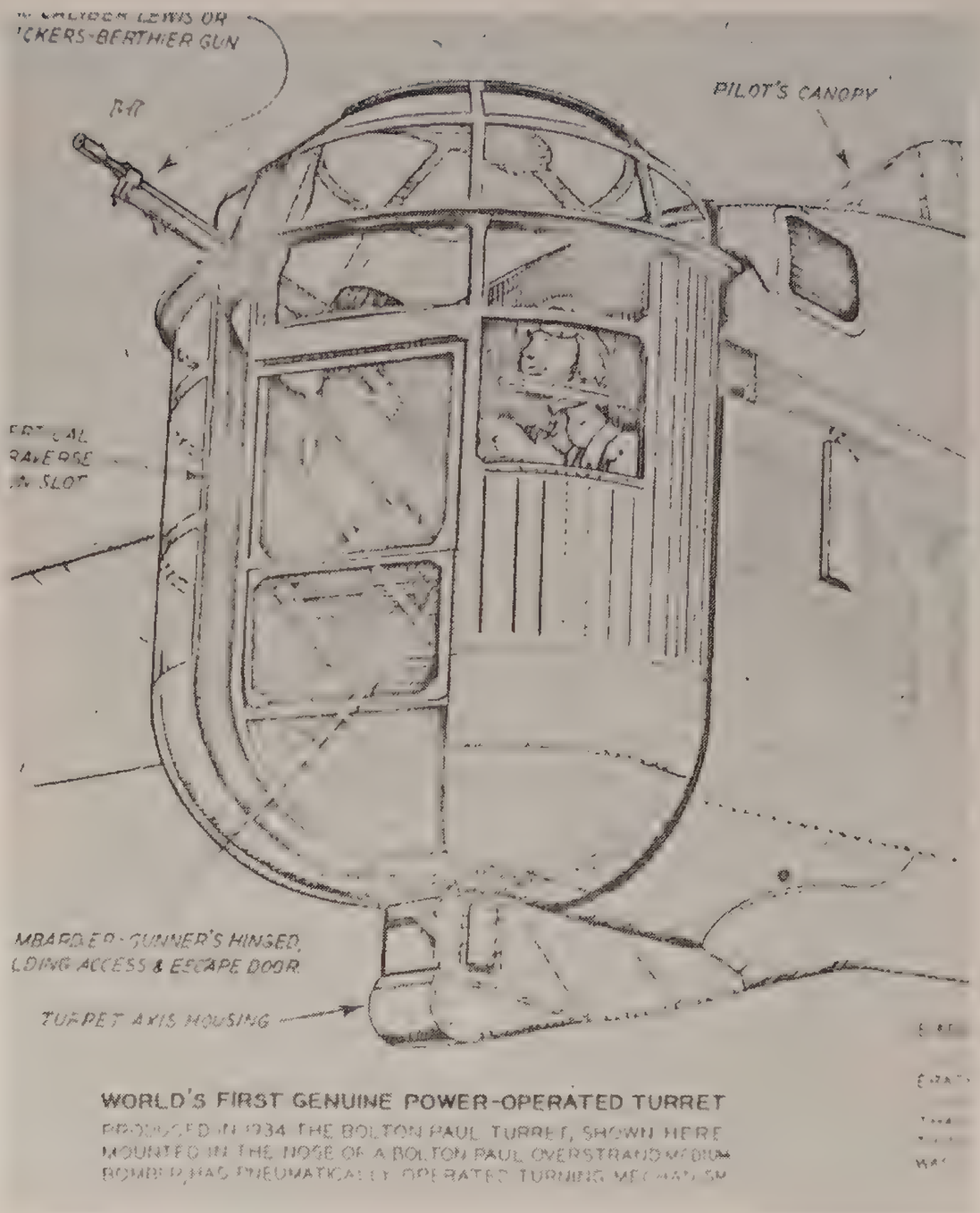
Below: The Japanese Mitsubishi B2M torpedo/bomber carried a flexible Lewis gun in 7.7mm (Japanese Type 92) throughout WWII.

Japanese Naval Institute


FRAZER-NASH SEMI-ENCLOSED ARMORED TURRET
THIS HYDRAULICALLY OPERATED TURRET APPEARED IN 1936. IT AFFORDED THE GUNNER SOME PROTECTION AGAINST THE SLIPSTREAM AND, IN LESSER DEGREE, FROM ENEMY GUNFIRE
NOTE THE PROTECTIVE FACE MASK REQUIRED FOR THE PARTIALLY EXPOSED GUNNER
BUBBLE TURRET
MANUALLY OP-
RONG WHITWORTH
UALLY LITTLE MORE
NCLOSED MODIFICA-
D SCARFF RING. IT
ONG BEFORE 1939
30 CALIBER LEWIS GUN
MODIFIED SCARFF
GUN RING MOUNT

Air Progress

The Armstrong Whitworth manually operated "Bubble" turret was simply an enclosed version of the Scarff-ring.

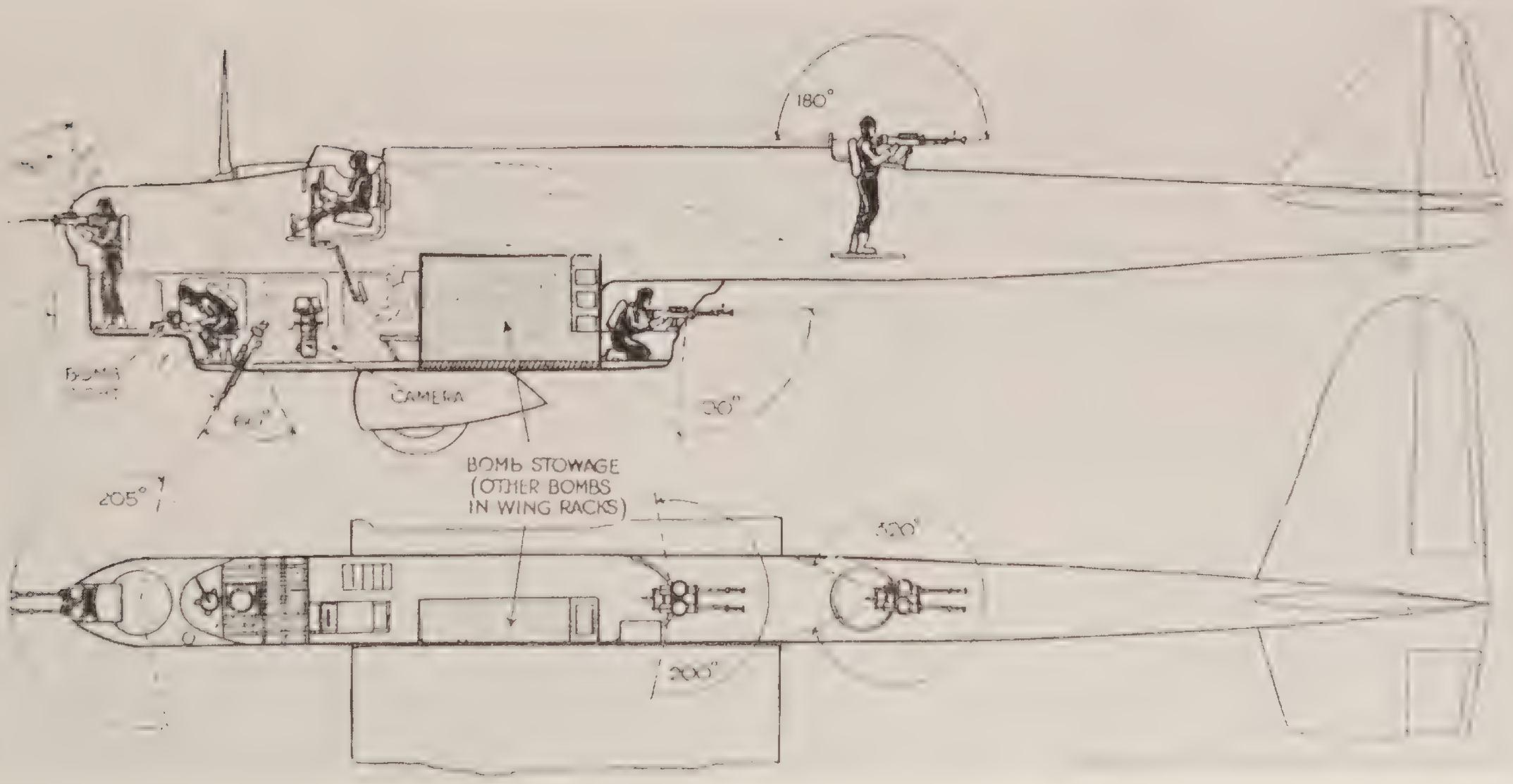


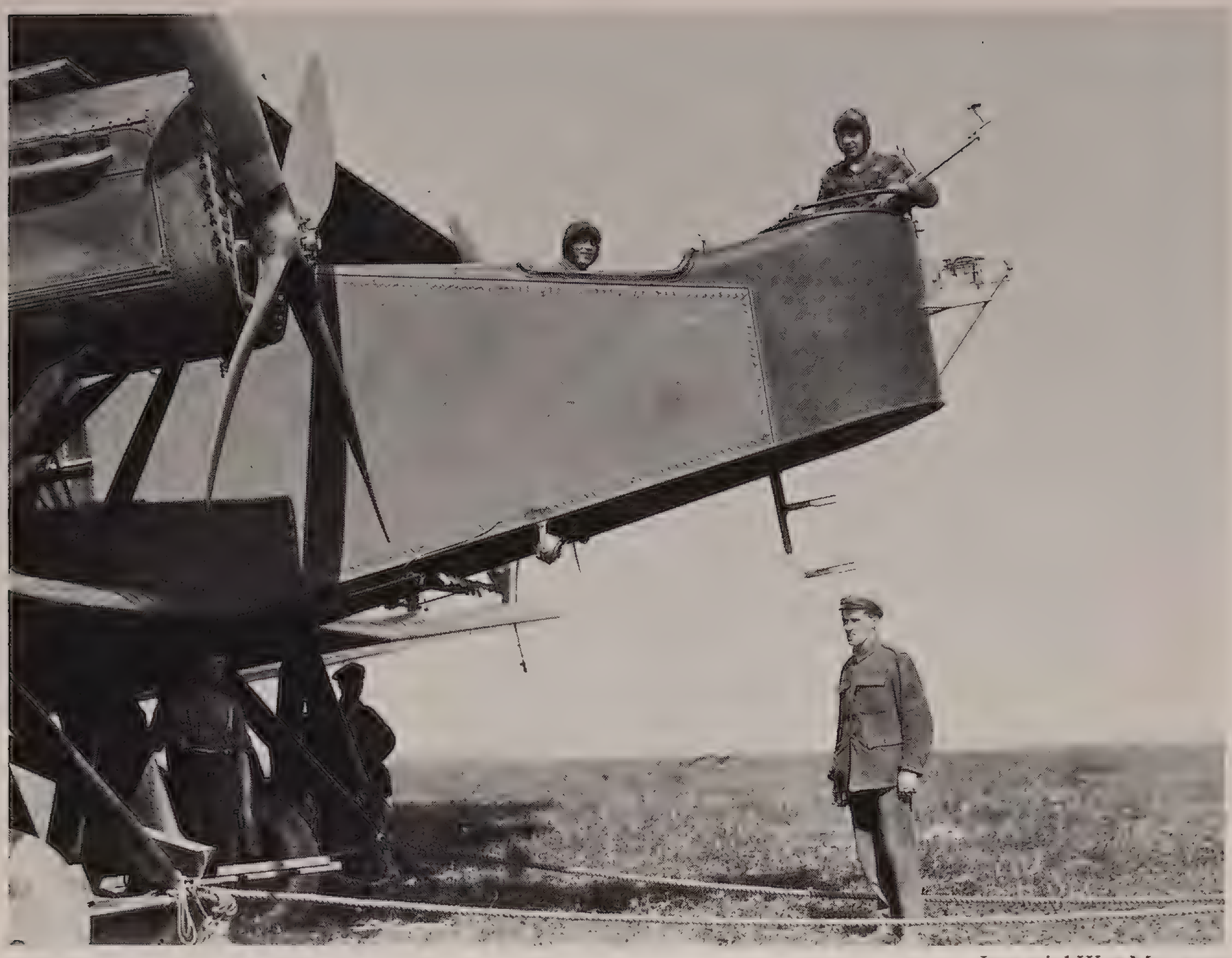
Air Progress

Produced in 1934, the Bolton Paul turret was the world's first truly power-operated turret. The gunner used a Lewis gun.

Sketch showing armament of Amiot aircraft ... note heavy use of Lewis guns.

FLIGHT Magazine





Imperial War Museum

Pilot and observer in Handley-Page bomber of No. 207 Squadron, France, summer of 1918.

Sopwith Camel with twin-mounted Lewis guns.

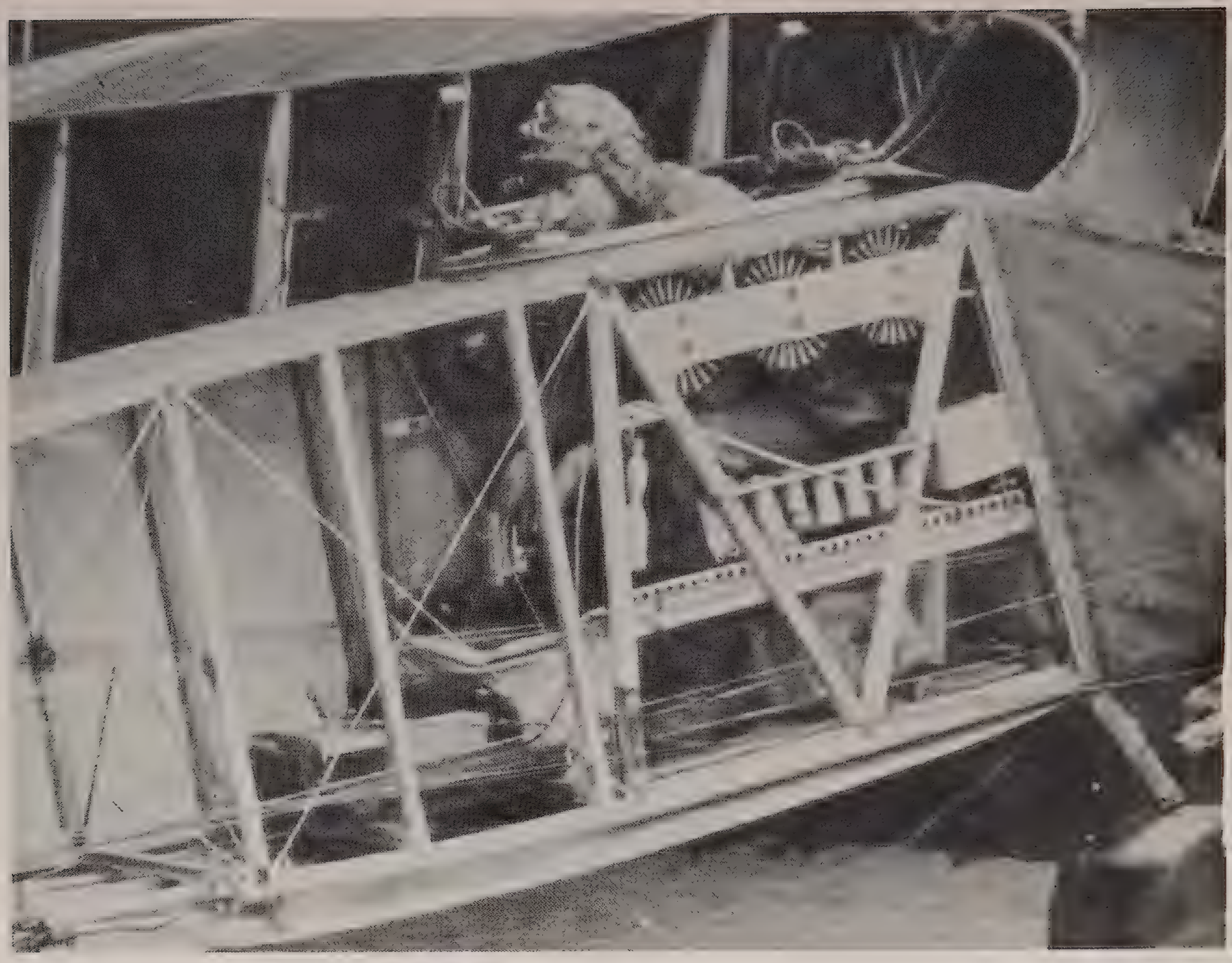
Canadian National Museum of Science & Technology

USN

Experimentally modified Lewis gun used for training in the 1920s.

The Russians used Nieuports armed with their modified Lewis guns. This ship belonged to the Russian 19th Squadron.

Charles Yust

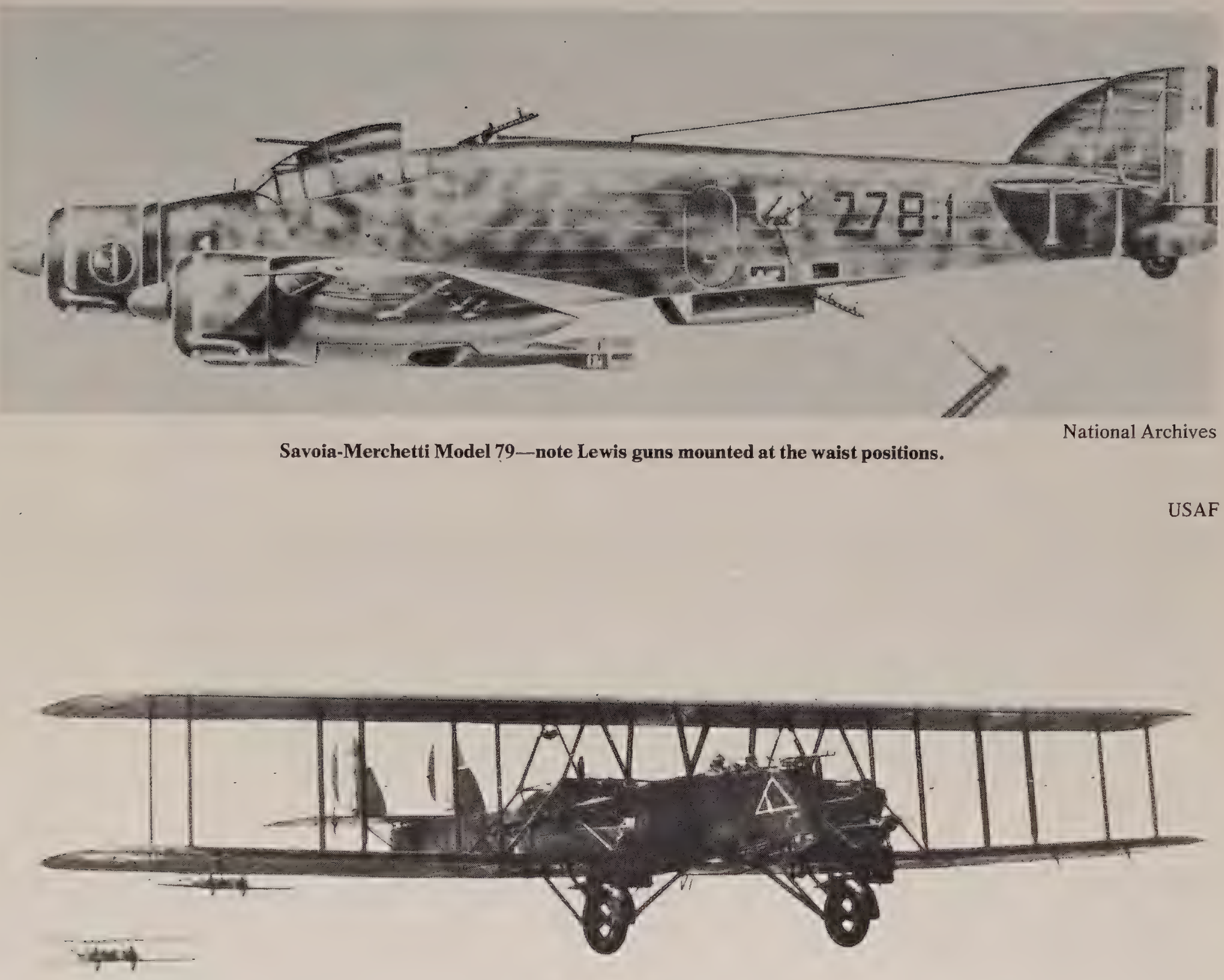


Col. G. B. Jarrett

The British removed the fabric from this Bristol Scout to show storage areas for Lewis drums and Very flare cartridges.

British crew poses in a Vickers F. B. 5 "Gun Bus" with early Lewis gun.

Imperial War Museum



National Archives

Savoia-Merchetti Model 79—note Lewis guns mounted at the waist positions.

USAF

The famous Martin MB-2 bombers were used by Gen. Billy Mitchell to prove landbound brass in error when he sunk five large warships with them in 1921 and 1923. The large bombers also carried Lewis guns as their armament.

Samuel McClain

The fliers' old favorite—the Fairey Swordfish carried a flexible Lewis gun.

Charles Yust

Captured Italian Savoia S. 79 in Sicily … note the Lewis gun in the top, midships turret.

Imperial War Museum

Imperial War Museum

The famed Vickers F. B. 9 "Gun Bus"

Aircraft armed with Lewis made in France under BSA license in 7.7mm.

Col. G. B. Jarrett

Imperial War Museum

This F. E. 2b two-seater was modified for night-fighting, with wind-driven generator for lighting mounted under the front nacelle. Lewis guns were mounted on either side of the device.

Australian War Memorial

Capt. Ross Smith and his gunner Lt. E. A. Mustar in their Bristol scout, No.1 Squadron in Palestine, 1918.

The Sopwith Baby was mounted with floats and used by the Royal Navy ... Lewis guns were mounted on the top wing.

Imperial War Museum

The heavily armed "Lucky Seven" aircraft of this Lafayette Escadrille Squadron carried two fixed Lewis guns for down firing or strafing, as well as a flexible pair of .303 Lewis guns.

USAF

Arch Whitehouse

Early version of the Gunbus had a hard landing in 1915. The ground model Lewis gun survived the crackup.

Col. G. B. Jarrett

Above: Austin Greyhound with Lewis armament.

Howard Leigh

Right: Vickers FB 5 "Gunbus" sketch

Charles Yust

B. E. 12B with Lewis armament.

Prototype Bristol Blenheim turret mounted on a converted Boulton Paul Sidestrand during the early '30s.

Col. G. B. Jarrett

National Canadian Museum of Science & Technology

A Canadian Nieuport 11 with twin-mounted French Lewis guns.

Pilots and observers of No. 22 Squadron in April of 1918, note observer in center with stripped Lewis gun.

Imperial War Museum

USAF

Raoul Lufbery seated in his Nieuport talks with his friends Soubiran and Masson, while the one crewman plays with Whiskey, the Squadron's pet. This photo was taken near the Somme in 1916.

The modified Vickers F. B. 26 used three Lewis guns in an Esman triple-gun mounting.

Imperial War Musuem

USAF

The Samson A2 was armed with the Lewis gun, and saw limited service at the end of the War. It was used as a reconnaisance aircraft on the Mexican border, as some of the airplanes, which were built in France, were shipped back to the States in 1919.

Ted Parsons and his SE5.

Charles Yust

Royal Air Force

An F. E. 2B in flight, a rare air-to-air photo. The old pusher was armed with a Lewis gun in the front cockpit.

USAF

A U. S. DH-4 with twin-mounted Lewis guns, ready to ship to Europe. Note the downward firing Marlin gun on the botton wing, and the top-mounted Marlin gun.

This B. E. 2c was donated by Indian royalty.

Imperial War Museum

National Archives

Billy Mitchell and French pilot stand beside Spad 16 with twin Lewis guns.

Another between-the-wars Curtis aircraft was the 18-T-2 with rear-mounted Lewis gun.

National Archives

Merle Olmsted Collection

Above: A restored SE5, photographed in 1962, with vintage Lewis gun.

Right: This Fe 2d was heavily armed with Lewis guns.

Imperial War Museum

Imperial War Museum

Mechanics of No. 32 Squadron check an SE5A prior to a mission from Humieres Aerodrome, April of 1918.

National Archives

Billy Mitchell mans the twin Lewis guns of a Spad 16 piloted by a French officer.

British Dyott biplane with front-mounted Lewis gun.

Col. G. B. Jarrett

Right: Observer loads an aerial camera aboard a Salmon aircraft armed with twin Lewis guns, August 1918.

Imperial War Museum

Below: FE 2B, night bomber, of No. 100 Squadron in France.

Imperial War Museum

Capt. Peter Hearn

Period sketch of Lewis armed British scout.

Salsom of 91st Aero Squadron.

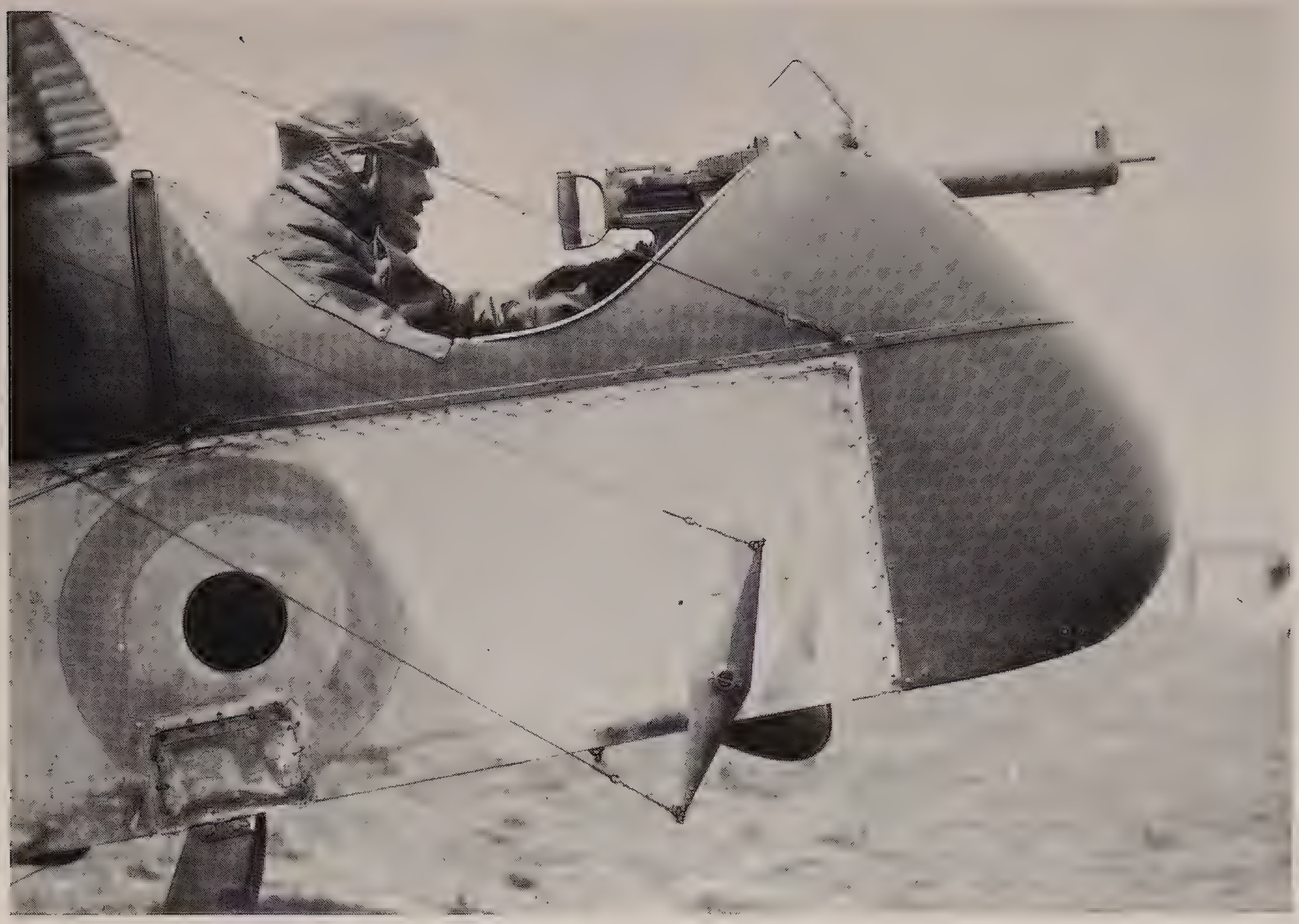
National Archives

Early production model S. E. 5 had partially enclosed cockpit and top-mounted French-made Lewis gun.

Imperial War Museum

BE2C fitted with four Lewis guns on its undercarriage … used in the Middle East.

Imperial War Museum

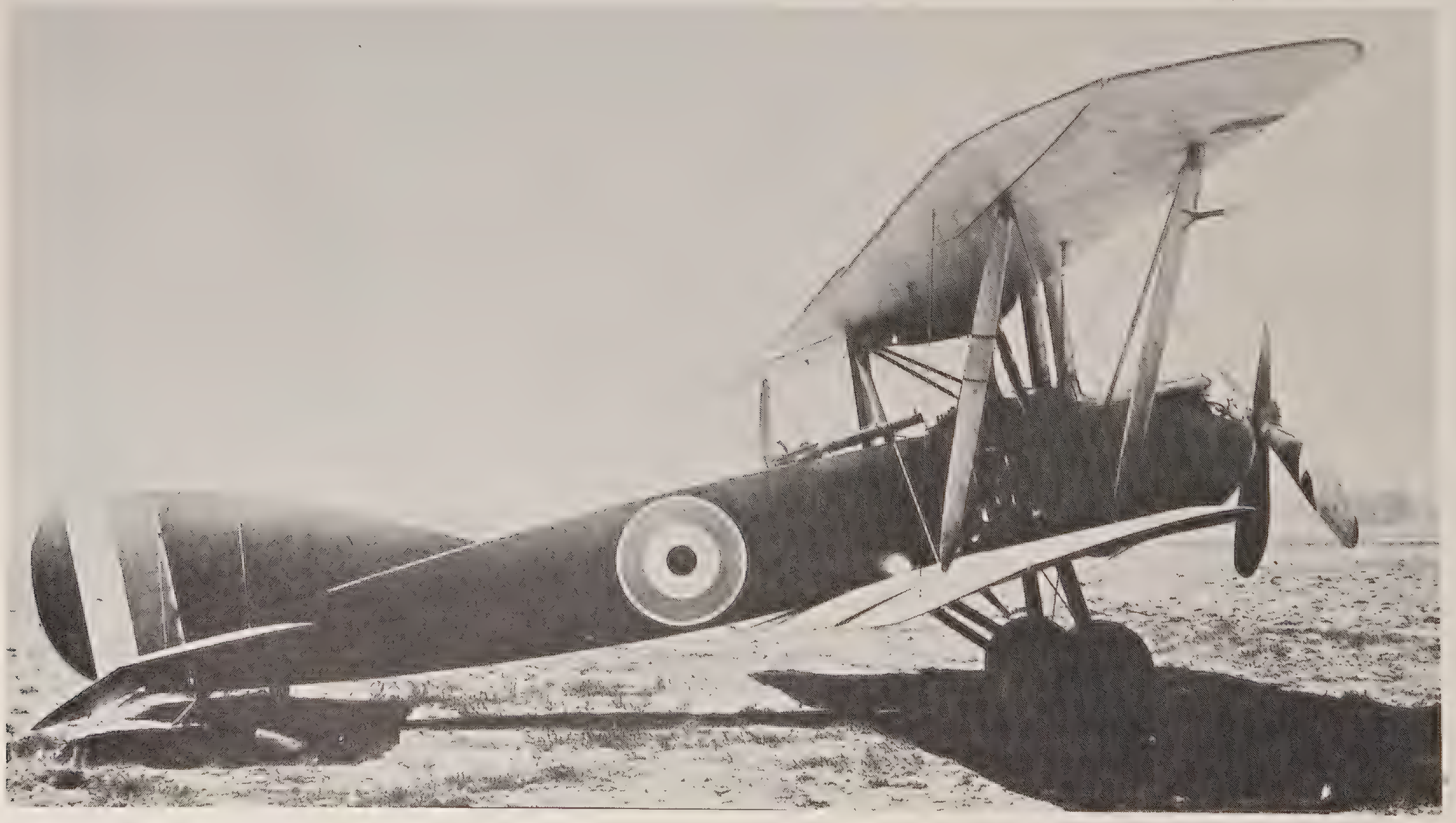


Imperial War Museum

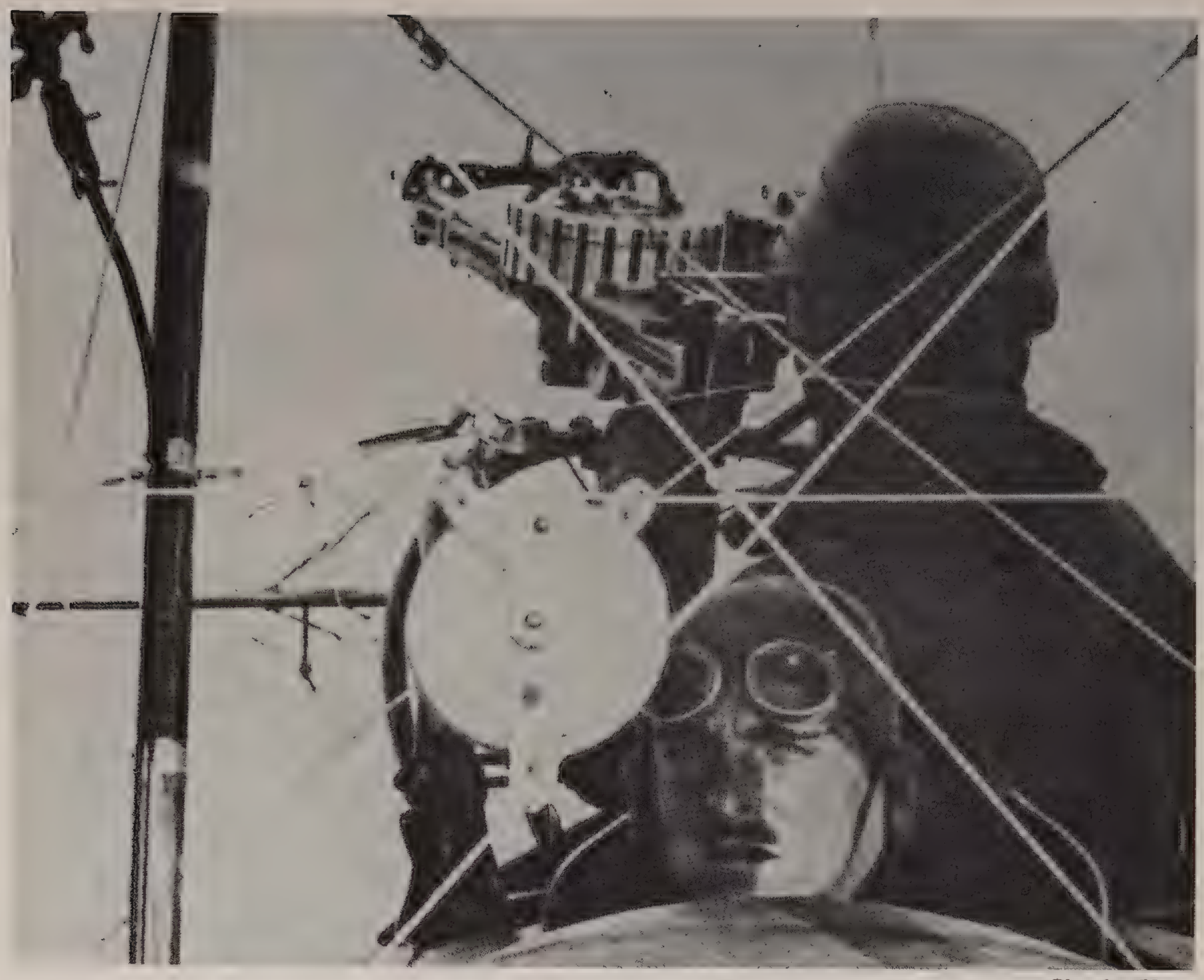
DeHavilland DH2 pilot with Lewis gun.

Vickers F. B. 14 with Lewis gun was a two-seater reconnaissance aircraft with fighter speed and power.

Imperial War Museum



Right: Unusual picture of pilot with his gunner/observer handling the Lewis gun.



Charles Yust

Below: Bristol F 2A two-seater with Lewis gun.

Imperial War Museum

Imperial War Museum

Experimental version of R. E. 7, three-seater, armed with two Lewis guns and two observers.

The Eastchurch PU 8 with Lewis gun.

J. David Truby

German airman with captured British Lewis gun.

Col. G. B. Jarrett

Nieuport with top-mounted Lewis gun and Le Prieur rockets.

National Archives

W. R. Sweeley, pilot, 91st Squadron and Lt. R. H. Vesey, gunner, Co. D. 30th Infantry, attached to report from Crissy Field of experimental course in Aerial gunnery for Infantry Organization, 1924.

USAF

National Archives

Russian Nieuport 17, armed with Lewis gun. Note Bolshevik star.

Imperial War Museum

Observer aboard an FE2B checks his Lewis gun prior to a night bombing mission from Aire Aerodrome, January, 1918.

Handley Page Heyford was armed with Lewis guns as late as 1935.

Col. G. B. Jarrett

Donald G. Thomas

Beardmore W. B. II with its Lewis armament.

Nieuport 10 of the Royal Navy Air Service, with Lewis gun on top plane.

Canadian National Museum of Science & Technology

E
A

Imperial War Museum

A flight of DeHavilland bombers at Serny Aerodrome in Feb. 1918.

Imperial War Museum

The large Grain Griffin carried only one Lewis gun.

The controversial RE 8 aircraft, nicknamed the "Harry Tate," by cynical pilots after the British comedian of that name.

Imperial War Museum

USAF

The Keystone B-6A was a heavily-armed bomber of the 1920s for the U.S. Army Air Corps.

The experimental Parnell N.2 A mounted a Vickers and a Lewis gun ... produced as the Parnell Panther fighter.

Imperial War Museum

Right: Fairey Swordfish with rear-mounted Lewis gun.

Col. G. B. Jarrett

Below: Heavily-Lewis armed Martin MB2 bomber designed by Glenn Martin.

USAF

9. The Last Shots

Charles Yust

Home Defense guard with his gas mask and Lewis gun.

In May of 1940, a faint wisp of smoke floated across the English Channel following the first reports of the crisis at Dunkirk. As an enormous fleet ferried British soldiers across to the Home Isles, anxious, over-age home guardsmen, were huddled under their pie-pan helmets, staring east over the barrels of their ancient Lewis guns. Once again the Lewis had been drafted; removed from cosmoline, some 80,000 of them were ready to meet the Germans in another war.

The United States was officially neutral, but decided after an interesting series of diplomatic maneuverings to come to the aid of her former allies, calling it "Lend Lease." Included in the original Lend Lease measure was an emergency shipment of 1,157 Lewis guns. An additional 45,880 Lewis guns were later released, valued at $1,630,249.60.

During the following months of World War II, the Lewis would see action in every theater of war; a battle-proved veteran, not to be declared officially obsolete until the end of 1945. It was, however, a valuable weapon, venerated by the British, Australian, French, Norwegian, Russian, Canadian, and German troops who used it.

By the end of World War II, most of the Lewis guns in allied hands were on reserve status or used as secondary armament on merchant ships of British and European countries. A few remained on U.S. Coast Guard ships, through 1946.

Lewis guns were also employed by the Haganah, in the 1947 War, and saw service during various border disputes and flare-ups through the middle 1950's. By 1956, the weapon was classed by Isreal as a reserve weapon, and was issued to reserve and police units.

Lewis guns were seen in Biafra in 1969, used by Ibo tribesmen. They were seen again in Vietnam, in the hands of the Viet Cong. In 1970, newsmen observed the Lewis at work in Northern Ireland, employed in the suppression of IRA freedom fighters. As you read these lines, somewhere in the world the Lewis is still fighting; a testament to Isaac Lewis' invention.

Isaac Lewis once said, "One of man's immortal claims is the pride of his name. No one can take that away from my family or from my gun."

Yes, the Lewis gun lives on.

J. David Truby

WAR Magazine

Above: Brave British fishermen struck back at the German air raiders, mounting Lewis guns on their frail fishing boats.

Preceding page: Lewis gunners in action aboard a trawler being used as a mine sweeper in the English Channel during WWII.

Konrad F. Schreier, Jr.

Anticipating more combat, Canadians practice anti-aircraft gunnery with the Lewis early in 1940.

Using a Lewis gun stolen during WWII, Haganah forces prepare an ambush during the 1947 fighting in the Middle East.

Haganah Archives

Haganah Archives

Haganah fighter with Lewis gun stolen from the British during WWII. The Lewis gun saw a lot of action during the 1947 and 1956 Middle East fighting.

Following page: Jewish Settlement Police worked with the British in 1943, all the while supplying weapons like the Lewis to the underground organization Haganah for later use.

Haganah Archives

Paul Popper Photo

Above: British troops armed with Enfields and a Lewis gun man a barricade in Dublin during the week-long fighting in 1916.

Below: Women trained with the Lewis during WWII in England.

Imperial War Museum

SOLDIER Magazine

Right: The Arab Legion used Jeep-mounted Lewis guns as mobile cavalry during WWII in the Middle East.

Below: The Gunner without Pants became a legend, even as the public furor died about the Japanese sinking the USS PANAY in 1937. The American ship was armed with Lewis guns, as was at least one of the Japanese Navy aircraft in the attack.

National Archives

Sylvart Photography, courtesy Dr. Lewis E. Gunn.

Above: Dr. Lewis E. Gunn, the man whose father named him after I. N. Lewis's famed machine gun stands beside the invention that prompted his name.